

Kitoi Bay Hatchery Annual Management Plan, 2007

by

Steve Schrof

and

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July 2007

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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| Weights and measures (metric) | | General | | Measures (fisheries) | |
|---------------------------------------|--------------------|--------------------------|----------------------------------|----------------------------------|-------------------------|
| centimeter | cm | Alaska Administrative | | fork length | FL |
| deciliter | dL | Code | AAC | mid-eye-to-fork | MEF |
| gram | g | all commonly accepted | | mid-eye-to-tail-fork | METF |
| hectare | ha | abbreviations | e.g., Mr., Mrs., AM, PM, etc. | standard length | SL |
| kilogram | kg | | | total length | TL |
| kilometer | km | all commonly accepted | | | |
| liter | L | professional titles | e.g., Dr., Ph.D., R.N., etc. | Mathematics, statistics | |
| meter | m | | | <i>all standard mathematical</i> | |
| milliliter | mL | at | @ | <i>signs, symbols and</i> | |
| millimeter | mm | compass directions: | | <i>abbreviations</i> | |
| | | east | E | alternate hypothesis | H _A |
| | | north | N | base of natural logarithm | <i>e</i> |
| | | south | S | catch per unit effort | CPUE |
| | | west | W | coefficient of variation | CV |
| | | copyright | © | common test statistics | (F, t, χ^2 , etc.) |
| | | corporate suffixes: | | confidence interval | CI |
| | | Company | Co. | correlation coefficient | |
| | | Corporation | Corp. | (multiple) | R |
| | | Incorporated | Inc. | correlation coefficient | |
| | | Limited | Ltd. | (simple) | r |
| | | District of Columbia | D.C. | covariance | cov |
| | | et alii (and others) | et al. | degree (angular) | ° |
| | | et cetera (and so forth) | etc. | degrees of freedom | df |
| | | exempli gratia | | expected value | <i>E</i> |
| | | (for example) | e.g. | greater than | > |
| | | Federal Information | | greater than or equal to | ≥ |
| | | Code | FIC | harvest per unit effort | HPUE |
| | | id est (that is) | i.e. | less than | < |
| | | latitude or longitude | lat. or long. | less than or equal to | ≤ |
| | | monetary symbols | | logarithm (natural) | ln |
| | | (U.S.) | \$, ¢ | logarithm (base 10) | log |
| | | months (tables and | | logarithm (specify base) | log ₂ , etc. |
| | | figures): first three | | minute (angular) | ' |
| | | letters | Jan,...,Dec | not significant | NS |
| | | registered trademark | ® | null hypothesis | H ₀ |
| | | trademark | ™ | percent | % |
| | | United States | | probability | P |
| | | (adjective) | U.S. | probability of a type I error | |
| | | United States of | | (rejection of the null | |
| | | America (noun) | USA | hypothesis when true) | α |
| | | U.S.C. | United States | probability of a type II error | |
| | | | Code | (acceptance of the null | |
| | | U.S. state | use two-letter | hypothesis when false) | β |
| | | | abbreviations | second (angular) | " |
| | | | (e.g., AK, WA) | standard deviation | SD |
| | | | | standard error | SE |
| | | | | variance | |
| | | | | population | Var |
| | | | | sample | var |
| Weights and measures (English) | | | | | |
| cubic feet per second | ft ³ /s | | | | |
| foot | ft | | | | |
| gallon | gal | | | | |
| inch | in | | | | |
| mile | mi | | | | |
| nautical mile | nmi | | | | |
| ounce | oz | | | | |
| pound | lb | | | | |
| quart | qt | | | | |
| yard | yd | | | | |
| Time and temperature | | | | | |
| day | d | | | | |
| degrees Celsius | °C | | | | |
| degrees Fahrenheit | °F | | | | |
| degrees kelvin | K | | | | |
| hour | h | | | | |
| minute | min | | | | |
| second | s | | | | |
| Physics and chemistry | | | | | |
| all atomic symbols | | | | | |
| alternating current | AC | | | | |
| ampere | A | | | | |
| calorie | cal | | | | |
| direct current | DC | | | | |
| hertz | Hz | | | | |
| horsepower | hp | | | | |
| hydrogen ion activity | pH | | | | |
| (negative log of) | | | | | |
| parts per million | ppm | | | | |
| parts per thousand | ppt, | | | | |
| | ‰ | | | | |
| volts | V | | | | |
| watts | W | | | | |

FISHERY MANAGEMENT REPORT NO. 07-39

KITOI BAY HATCHERY ANNUAL MANAGEMENT PLAN, 2007

by

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and
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KITOI BAY HATCHERY ANNUAL MANAGEMENT PLAN

EXECUTIVE SUMMARY, 2007

New Projects for 2007:

1. Remove half of old incubator racks in old hatchery and replace with new racks and install headboxes.
2. Construct food-grade egg-take building.
3. Cost Recovery: Conduct cost recovery with a goal of 7,000,000 pounds.

| Stocking Location (Broodstock) | 2007 Projected Enhanced Run | 2007 Stocking Plan | | 2007 Egg - Take Goals | | | Fish Transport Permits | | | |
|-----------------------------------|--------------------------------|--------------------|------------|-----------------------|---------------|------------|------------------------|------------|-------------|-------------|
| | | Releases | Brood Year | 2007 Eggs | 2008 Stocking | Lifestage | Number | Expiration | Max. Eggs | Max. Juv. |
| Kitoi Bay pink (BKC) | 4,700,000 | 142,000,000 | 2006 | 180,000,000 | 145,000,000 | fry | 06A-0073 | 31-Aug-11 | 215,000,000 | 182,000,000 |
| Kitoi Bay chum (BKC) | 415,000 | 21,200,000 | 2006 | 25,000,000 | 22,000,000 | fry | 06A-0072 | 31-Aug-11 | 25,000,000 | 22,000,000 |
| Kitoi Bay coho (BKC) | 149,000 | 1,060,000 | 2005 | 1,300,000 | 1,000,000 | smolt | 02A-0007 | 01-May-12 | 1,300,000 | 1,000,000 |
| Jennifer Lake coho (BKC) | 4,000 | 200,000 | 2006 | 300,000 | 200,000 | fingerling | 02A-0009 | 01-May-12 | 300,000 | 250,000 |
| Ruth Lake coho (BKC) | 600 | 30,000 | 2006 | 60,000 | 30,000 | fingerling | 02A-0011 | 01-May-12 | 60,000 | 50,000 |
| Crescent Lake coho (BKC) | 3,300 | 165,000 | 2006 | 600,000 | 165,000 | fingerling | 02A-0008 | 15-May-12 | 600,000 | 500,000 |
| Katmai Lake coho (BKC) | 750 | 15,000 | 2006 | 40,000 | 15,000 | presmolt | 02A-0010 | 01-May-12 | 40,000 | 30,000 |
| Little Kitoi Lake sockeye (SL) | 72,000 | 380,000 | 2005 | 600,000 | 400,000 | presmolt | 05A-0078 | 12-Jun-10 | 1,200,000 | 500,000 |
| Little Kitoi Lake sockeye (SL) | | 100,000 | 2006 | | 100,000 | presmolt | 05A-0078 | 12-Jun-10 | 1,200,000 | 500,000 |

Broodstocks: BKC – Big Kitoi Creek (Kitoi Bay Hatchery); SL – Sallery Lake.

ABSTRACT

The Kitoi Bay Hatchery (KBH) is located on Afognak Island about 48 kilometers (30 miles) north of the city of Kodiak and is financed and operated by the Kodiak Regional Aquaculture Association. Currently, KBH incubates and rears a single stock of each of the following salmon species: pink *Oncorhynchus gorbuscha*, chum *O. keta*, coho *O. kisutch*, and sockeye *O. nerka* salmon. This management plan describes: 1) projected releases of juvenile salmon in 2007, 2) egg takes in 2007 and projected releases in 2008 and 2009, 3) salmon harvest management in 2007, 4) additional measures for wild stock protection in 2007, and 5) evaluation plans for 2007.

Approximately 142,000,000 pink salmon fry (Big Kitoi Creek stock) will be released in 2007. The 2007 adult returns from the 2006 fry releases into Kitoi Bay are expected to be about 4,700,000 pink salmon, of which 4,350,000 will be available for harvest. About 350,000 adult broodstock will be used in 2007. Hatchery personnel will collect 180,000,000 pink salmon eggs in 2007 and plan to release approximately 145,000,000 fry into Kitoi Bay in 2008.

KBH plans to release 21,200,000 chum salmon fry (Big Kitoi Creek stock) into Kitoi Bay in 2007. Prior fry releases are expected to produce a return of about 415,000 adult chum salmon, of which 383,000 will be available for harvest in 2007. Approximately 30,000 adult chum salmon will be collected for broodstock and an additional 2,000 chum salmon will be allowed to escape in Big Kitoi Creek in 2007. These fish will provide 25,000,000 eggs for a chum salmon release of 22,000,000 fry in 2008.

About 1,060,000 coho salmon smolt (brood year (BY) 2005 Big Kitoi Creek stock) will be released into Big Kitoi Bay in 2007. A total of approximately 395,000 fingerlings (BY 2006 Big Kitoi Creek stock) will be released into Jennifer, Ruth, and Crescent Lakes and 15,000 presmolt will be released into Katmai Lake in 2007. The 2007 forecast for returns of coho salmon is about 149,000 adults. About 2,300,000 eggs will be collected in 2007, which are expected to produce about 395,000 fingerlings and 15,000 presmolt for release in 2008 and 1,000,000 coho salmon smolt for release in 2009.

In 2007, approximately 380,000 sockeye salmon presmolt (BY 2005 Saltery Lake stock) will be reared in net pens and allowed to imprint in Little Kitoi Lake (LKL), prior to non-volitional release into Little Kitoi Bay. In addition, approximately 100,000 BY 2006 sockeye salmon presmolt will be released into LKL in the fall of 2007. About 400,000 sockeye salmon fingerling (BY 2006) are currently incubating at Kitoi Bay Hatchery and will be reared at KBH throughout 2007, imprinted in LKL, and released into Little Kitoi Bay in the spring of 2008. Approximately 72,000 adult sockeye salmon are forecasted to return to Little Kitoi Lake in 2007. About 600,000 eggs for future sockeye salmon releases will be collected in 2007 by Pillar Creek Hatchery personnel and transferred to KBH in the fall of 2007.

A cost recovery fishery, similar to the 2006 fishery, except with a lower goal of 7,000,000 pounds, will be executed at Kitoi Bay in 2007. The fishery will target primarily pink salmon as in previous years, but some chum, sockeye and coho salmon will likely be caught incidentally.

Key words: Kitoi Bay Hatchery, Kodiak Regional Aquaculture Association, salmon, broodstock, stocking, fry, fingerling, presmolt, smolt, harvest management, cost recovery

INTRODUCTION

Kitoi Bay Hatchery (KBH) is located on Afognak Island (58° 11.04' N lat., 152° 21.04' W long.) on the west side of Izhut Bay approximately 48 km (30 miles) north of the city of Kodiak (Figure 1). The hatchery infrastructure was constructed in 1954 by the United States Department of the Interior, Fish and Wildlife Service (FWS), but was destroyed in the 1964 earthquake and then rebuilt by the Alaska Department of Fish and Game (ADF&G) in 1965. The hatchery was initially designed as a sockeye salmon *Oncorhynchus nerka* research facility. In 1976, the hatchery production priorities switched to pink salmon *O. gorbuscha* enhancement. The present goal of the facility is to provide enhanced salmon fishing opportunities for the Kodiak Management Area (KMA) commercial fishers by increasing the returns of pink, chum *O. keta*, coho *O. kisutch*, and sockeye salmon primarily to the Kitoi Bay area (Figures 2 and 3). KBH was

designed to increase salmon production for KMA commercial seine and set gillnet fisheries. Secondary user groups (in terms of the number of salmon harvested) of hatchery production include subsistence and recreational fishers. KBH has the capacity to produce 170 million juveniles of all life stages (fry, fingerling, presmolt, and smolt). Funding for the hatchery was provided exclusively by ADF&G prior to fiscal year (FY) 1987, and was provided jointly by ADF&G and Kodiak Regional Aquaculture Association (KRAA) from FY 1987 to FY 1991. The hatchery has been fully funded by KRAA, since FY 1992.

KBH is primarily a site-specific production facility where the majority of eggs are collected and incubated on-site and resultant juveniles of all life stages are reared and released from the hatchery. The majority of the returning adults are caught by Kodiak's commercial salmon net fishers in the Duck, Izhut, and Inner and Outer Kitoi Bay sections of the Afognak District (Figures 2 and 3).

Big Kitoi Lake (BKL) supplies KBH with water through two deep and one shallow 35.6-cm (14-inch) diameter pipelines (Figure 4). The two deep pipelines extend 457 m (500 yards) and 732 m (800 yards) into BKL, drawing water from depths of 15.2 m (50 feet) and 22.9 m (75 feet), respectively. These deep pipelines join downstream of the dam and supply one pipeline extending to the hatchery with water temperatures ranging from 2.0°C to 6.0°C. The shallow pipeline draws water from a depth of 1.5 m, supplying water with temperatures ranging from 0.5°C to 19°C. These pipelines connect to a manifold allowing the hatchery to control water temperatures in any part of the hatchery. Excess lake water drains from BKL through Big Kitoi Creek (BKC; Figure 4). BKC contains a barrier falls approximately 503 m (550 yards) upstream from salt water and 183 m (200 yards) downstream from BKL that prevents adult salmon from entering the lake. A weir is installed at the mouth of the creek and adjacent to the KBH fish ladder to facilitate collection of pink, chum and coho eggs from returning adults. Coho and chum salmon ascend a fish ladder at the weir and enter two raceways adjacent to the hatchery facility where they are utilized for egg takes. Pink salmon are unable to ascend the entire fish ladder to the broodstock raceways in sufficient numbers and are collected from the lower section of the ladder during egg takes.

Little Kitoi Lake (LKL) is located approximately 0.40 km (0.25 miles) north of KBH (Figure 4). LKL drains through concrete raceways and a fish pass system located at the lake outlet. All returning adult salmon must pass through this system before entering the lake. The raceways are designed to control movement of both returning adults and outmigrating smolt, enabling the single system to monitor escapement and outmigration simultaneously. While the adult and smolt systems are capable of operating at the same time, smolt can be injured traveling down the fish pass; therefore, the fish pass is shut down during the smolt outmigration. Smolt outmigrate through the smolt compound and into a 20.4 cm (8 inch) pipeline bypass adjacent to the adult fish pass. The fish pass and outmigration pipeline drain directly into Little Kitoi Bay.

The development of a pink salmon brood source began at the hatchery in 1976 using donor stock from BKC (Honnold and Aro 2003, 2004, and 2005). Pink salmon are the only salmon species indigenous to BKC. The program expanded from an egg collection of approximately 5 million eggs in 1976 to 215 million eggs in 1989. Recent increases in green-egg to eyed-egg survival have lowered the pink salmon egg-take requirement to a range of about 175 to 180 million eggs. All pink salmon eggs are collected from broodstock returning to BKC and are incubated at KBH. The resultant fry are reared in saltwater net pens adjacent to the hatchery for a period of three to eight weeks prior to release into Big Kitoi Bay.

A chum salmon broodstock program using Sturgeon River (Kodiak Island) stock was initiated in 1980 (Honnold and Aro 2003, 2004, and 2005). The first chum salmon egg take occurred at the hatchery in 1986. Thereafter, runs have been adequate to collect broodstock, but the hatchery production goal of 25 million eggs (a 22-million fry release) was not consistently achieved until recent years as run sizes have increased and broodstock collection has improved. In 1991, an infectious hematopoietic necrosis virus (IHNV) outbreak resulted in a complete brood year (BY) failure in 1990. After the IHNV outbreak, ultraviolet (UV) light water disinfecting units were installed in the hatchery to sterilize all chum incubation water in an effort to prevent further disease outbreaks. The UV water treatment has been successful; no outbreaks of IHNV in chum fry have occurred since the units were installed. Chum salmon fry produced at the hatchery are reared in saltwater net pens adjacent to the hatchery for a period of six to twelve weeks prior to release into Big Kitoi Bay.

A coho salmon stocking project using Buskin Lake and LKL wild stocks was started at KBH in 1982 (Honnold and Aro 2003, 2004, and 2005). Coho fry were released into a number of Kodiak road system lakes and a portion were stocked into Buskin (Buskin Lake broodstock) and Little Kitoi lakes (LKL broodstock; Figure 1). In 1990, coho salmon fingerlings were released into Kitoi Bay (wild LKL stock) to develop a hatchery broodstock returning to BKC and to increase the commercial harvest in the Kitoi Bay area. Since 1993, coho salmon runs have been adequate for hatchery egg takes and have provided enough eggs to reach production goals (about 2.3 million eggs). The majority of juvenile coho are released from the hatchery into Big Kitoi Bay at the smolt life stage; however, some juveniles are released as fingerlings into two local lakes, Jennifer and Ruth Lakes in the Kitoi Bay area (Figure 4). Coho salmon fingerlings are also stocked into Crescent Lake, adjacent to Port Lions (Figure 5) and presmolt are stocked into Katmai Lake (adjacent to Ouzinkie village; Figure 1). These projects have contributed coho salmon to the subsistence fisheries for the villages of Port Lions and Ouzinkie. The local school students assist with the Katmai Lake stocking program as part of their school curriculum.

KBH collected eggs from an age-0 component of the late-run Upper Station Lake sockeye salmon stock from 1988 through 1994 to develop a late-run sockeye salmon broodstock that would return to LKL (Figure 1; Hall et al. 1997; Honnold and Aro 2003, 2004, and 2005). The age-0 fish spend only a few weeks rearing in Upper Station Lake (lower Olga Lake) before migrating to the ocean; thus, adults return sooner than those fish that rear for the typical one to two years in freshwater. The intent of this project was to create a return of sockeye salmon to LKL that could be used as an egg source for Pillar Creek Hatchery (PCH) with resultant fry being stocked into Spiridon Lake (Figure 1). Survivals from the age-0 juvenile releases were poor, which resulted in modifications to the project in 1993 to include the stocking of age-0 presmolt (late fall releases) into LKL and age-1 smolt (late spring releases) into Little Kitoi Bay.

Previously, salmon stocking into LKL had been avoided because the lower depths of the lake contained a high concentration of hydrogen sulfide. This layer was the result of saltwater intrusion during the 1964 earthquake (Schrof et al. 2000). The layer acted like a “nutrient sink,” reducing the ability of the lake to support zooplankton, which is the primary food source for juvenile sockeye salmon. In 1995, a 20.4 cm (8 inch) pipeline was sunk into the lake and most of the hydrogen sulfide laden water was siphoned off. Although a small amount of hydrogen sulfide remained, the zooplankton levels immediately showed signs of improvement.

The enhancement strategies initially used to develop a LKL sockeye salmon run relied on the late-run Upper Station stock as a brood source. However, research by ADF&G concluded that

the SALTERY Lake sockeye salmon stock was preferred for Spiridon Lake and LKL stockings (Clevenger et al. 1997; Honnold 1997). The earlier run timing of SALTERY Lake sockeye salmon (about three weeks earlier than the late-run Upper Station sockeye stock) was expected to improve returns to Little Kitoi Lake and make broodstock collection easier. Additionally, the earlier run timing was expected to reduce the incidental harvest of Spiridon River pink and chum salmon stocks during the terminal fishery targeting returns to Spiridon Lake. Therefore, in 1997 SALTERY Lake sockeye salmon were used for the LKL broodstock development program.

Several direct release strategies into LKL were implemented in an attempt to maximize the survival and reduce holdover of the SALTERY Lake sockeye smolt. In addition, nutrients were added to LKL during 2000-2001 to improve zooplankton productivity (Schrof and Honnold 2003) and although it did improve the levels, the resulting smolt emigrations were still inadequate. Regardless of release method and fertilization, LKL was unable to support the required amount of juveniles to make the broodstock development project successful. Recent limnological data suggest that LKL continues to be a marginal environment for successfully rearing sockeye salmon (Schrof and Honnold 2003). These data indicate inadequate zooplankton production and a reduced capacity for the lake to support juvenile sockeye salmon releases. Consequently, releases have been reduced to match the theoretical carrying capacity of the LKL, which has reduced the number of outmigrating smolt.

In 2003, the broodstock development program was modified in response to the low number of outmigrants and poor zooplankton levels in LKL (Honnold and Aro 2003). A modest number (100,000) of presmolt were released (SALTERY Lake broodstock) into LKL in the fall, as in the previous years, but a portion of the juveniles were reared at KBH through the winter. These fish (initially 190,000) were transferred into net pens in LKL during the second week of May at an average size of about 18 grams. After two and a half weeks of lake rearing, the smolt (approximately 25 grams) were siphoned out of the net pens directly into Little Kitoi Bay. This release coincided with the peak of the resident sockeye smolt outmigration. The experimental strategy was very successful in its first year and a Permit Alteration Request (PAR) was approved to continue the rearing strategy and expand the project in 2006. Additional raceways at KBH were installed in 2005 to accommodate the expansion to the production level of 500,000 presmolt. Approximately 400,000 juveniles reared in net pens and 30,000 LKL resident sockeye smolt should be produced annually (assumed 30% smolt survival from 100,000 fall outstocking), which should provide adequate numbers of returning adults to achieve the broodstock development goal. PCH will release an additional 100,000 juveniles into LKL in an effort to increase the number of emigrating smolt to the average historical levels (approximately 60,000 smolt) that have typically left the lake.

This purpose of this management plan is to describe: 1) projected releases of juvenile salmon in 2007, 2) egg takes in 2007 and projected releases in 2008 and 2009, 3) salmon (enhanced stocks) harvest management in 2007, 4) additional measures for wild stock protection in 2007, and 5) evaluation plans for 2007. Appendix A describes historical juvenile salmon releases from KBH, by species. Inseason assessments and project approvals by the KRAA, ADF&G, or the FWS may result in changes to this management plan in order to reach or maintain program objectives.

RELEASES IN 2007

PINK SALMON: BIG KITOI CREEK STOCK

KBH will release approximately 142,000,000 0.65-g pink salmon fry in 2007 (Table 1). The fry will be volitionally released from the hatchery into saltwater net pens via pipelines, reared in saltwater for a period of three to eight weeks, and then released in the Inner Kitoi Bay section (Figures 3 and 4).

Approximately 4,544,000 adult pink salmon are expected to return to KBH in 2008 from this release based on a stocking-to-adult survival of approximately 4.55% (Tables 1 and 2; average marine survival). The pink salmon run should begin in late July, peak in early August and end in late August (Figure 6). Most pink salmon returning to KBH will be harvested in the commercial salmon fishery in Izhut, Duck, and Kitoi Bay sections (Figure 3).

CHUM SALMON: BIG KITOI CREEK STOCK

Approximately 21,200,000 2.5-g chum salmon fry will be released directly into Big Kitoi Bay in 2007 (Table 1; Figures 3 and 4). Most of the BY 06 chum fry (85%) in 2007 will be non-volitionally released from Nopad incubators during the first three weeks of March. The remaining 15% will volitionally outmigrate from the incubators to the saltwater net pens. This will be the third year of the non-volitional release of chum salmon fry that is intended to increase the rearing time in saltwater; thereby resulting in larger fry at release and increasing marine survival. Fry are reared in saltwater net pens from six to twelve weeks.

Non-volitional release is a common technique used throughout Alaskan hatcheries, primarily used for chum salmon, but also for pink salmon fry. The technique requires the use of a Nopad incubator, which is a stackable incubator that can be moved around to facilitate the non-volitional release. The yolk sac fry are sampled prior to release to determine the percent of yolk sac to body weight. When the yolk sac approaches 3 to 5% of the fry's body weight, the fry are ready to enter saltwater. At this point the incubators are lifted with an electric forklift, brought to a tank, submerged and emptied of all fry and incubator substrate. The water upwells over a bar grate on the tank and into another tank. The fry fall through the grate and flow by gravity to saltwater net pens. The substrate is separated from the fry by the bar grates and is removed for cleaning.

Non-volitional release will allow approximately 85% of the chum fry to enter saltwater by the last week in March, which is approximately four weeks earlier than the previous volitional method allowed. This is made possible by recent improvements in the UV water manifold, which allows warmer shallow water to be used for chum salmon incubation. Egg development of later egg take lots will be accelerated to equal the earliest lots, so that all fry will be ready to enter saltwater at the same time. The extended rearing period is expected to increase chum salmon fry size by approximately 40% or more. The marine survival of chum salmon fry of this size is expected to range from 3.0 to 7.0% compared to the present average survival of 1.4% for KBH releases (Honnold and Aro 2004).

Applying a conservative estimate of 3.0% stocking-to-adult survival, results in approximately 636,636 adults returning from the 2007 release beginning in 2009 and continuing through 2012 (Tables 1 and 2). Approximately 483,360 age-0.3 chum salmon (three years ocean residence) are expected to return in 2010. Chum salmon runs into Kitoi Bay usually begin in early June, peak in mid June to early July and end in early August (Figure 6). Most chum salmon returning to KBH

will be harvested in the commercial salmon fishery in the Duck, Izhut, and Kitoi Bay sections (Figure 3).

COHO SALMON: BIG KITOI CREEK STOCK

Hatchery personnel will release 1,060,000 20.0-g age 1. coho salmon smolt (BY 2005, BKC broodstock) into Big Kitoi Bay in 2007 (Table 1). Initial imprinting will occur prior to transfer into saltwater, while smolt are still in the hatchery freshwater raceways. The smolt will be transferred from the hatchery via pipelines into saltwater net pens and reared for about four weeks to provide additional time for imprinting and adjusting to ocean salinity (osmoregulation). The saltwater net pens will be located in the vicinity of the BKC discharge (KBH water source), which is intended to provide further imprinting to BKC.

Approximately 169,600 adults (assuming a 16.0% survival) are projected to return in 2008 as a result of the 2007 coho salmon smolt release (Tables 1 and 2).

Additional coho salmon (BY 2006 BKC broodstock) releases in 2007 in the Kitoi Bay area will include 200,000 0.7-g coho fingerlings into Lower Jennifer Lake and 30,000 0.7-g coho fingerlings into Ruth Lake (Table 3; Figure 4). About 2.0% of these releases, including 4,000 adults to Jennifer Lake and 600 adults to Ruth Lake, are expected to return in 2010 (Tables 2 and 3). All returning adults to Jennifer and Ruth lakes will be available for harvest, due to stream barriers (waterfalls) near tide water preventing further migrations.

Coho salmon runs into Kitoi Bay usually begin in early August, peak in mid to late August and end in early September (Figure 6). Most coho salmon returning to KBH should be harvested in the commercial salmon fishery in the Duck, Izhut, and Kitoi Bay sections (Figure 3).

Remote releases (BY 2006 BKC broodstock) of 165,000 0.7-g coho fingerlings into Crescent Lake (Port Lions village area; Figure 5) and 15,000 7.5-g coho presmolt into Katmai Lake will also occur in 2007 (Ouzinkie village; Table 3; Figure 1).

Adult returns from these releases are projected to be 3,300 fish (2.0% survival) to Crescent Lake in 2010 and 750 fish (5.0% survival) to Katmai Lake in 2009 (Tables 2 and 3). The residents of each neighboring village primarily harvest these salmon during sport and subsistence fisheries. A portion of the Crescent Lake run may be available for commercial harvest in the Northwest Kodiak District (Figure 2) and the Settler Cove Special Harvest Area (SHA; Figure 5; 5 AAC 18.364, 5 AAC 40.085 (5)).

The coho salmon stocking capacity of Ruth, Jennifer, Crescent, and Katmai lakes is based upon the surface area of each lake. Release numbers are adjusted, if needed, in response to zooplankton biomass trends at each lake. All juvenile coho salmon stocked into lakes are transported to each site by floatplane using transfer tanks. The Katmai Lake release requires additional transport by two four-wheelers equipped with small transfer tanks.

SOCKEYE SALMON: SALTERY LAKE STOCK

KBH will release 380,000 BY 2005 sockeye salmon presmolt into net pens at LKL in May 2007 (Table 4). The BY 2005 juveniles will be transported to LKL in a tank, pumped into net pens to temporarily rear for approximately two weeks to imprinted on the waters of LKL, and then siphoned out of the nets into a concrete compound at the lake outlet. The non-volitional release will occur during the peak outmigration of the resident sockeye salmon smolt, which usually

occurs around the last week in May or first week in June. In addition, about 100,000 BY 2006 presmolt will be released in October 2007 into LKL.

The 2007 releases are expected to produce approximately 65,000 adults returning to LKL from 2008 through 2012 (Table 4). The majority of the returns should occur in 2009 through 2011 with the initial run beginning in late June, peaking in mid to late July and ending in mid August (Figure 7; Honnold 1997).

SUMMARY OF 2007 RELEASES

In summary, releases in 2007 will include: 142,000,000 pink salmon fry (BY 2006), 21,200,000 chum salmon fry (BY 2006), 1,060,000 coho salmon smolt (BY 2005), 395,000 coho fingerlings (BY 2006), 15,000 coho presmolt (BY 2006), 380,000 sockeye salmon spring presmolt (BY 2005), and 100,000 sockeye salmon fall presmolt (BY 2006; Tables 1, 3, and 4).

EGG TAKES IN 2007 AND RELEASES IN 2008 AND 2009

PINK SALMON: BIG KITOI CREEK STOCK

About 350,000 adult pink salmon returning to KBH will be used for broodstock in 2007 (Tables 5 and 6). Approximately 180,000,000 eggs will be collected in 2007 to provide for the release of 145,000,000 0.75-g pink salmon fry into Big Kitoi Bay in 2008. The actual number released may be less depending on how many chum salmon eggs are collected and the egg-to-fry survival of both species. If the maximum chum salmon egg take occurs (25,000,000 eyed-eggs), incubation space will not be available for a maximum pink salmon egg take.

The 2008 release is expected to result in approximately 13,000,000 (assuming a 5.3% survival) adult pink salmon returning to KBH in 2009 (Tables 2 and 6).

CHUM SALMON: BIG KITOI CREEK STOCK

Approximately 30,000 chum salmon adults returning to KBH in 2007 will be used for broodstock to achieve an egg-take goal of 25,000,000 eggs (Tables 5 and 6). Approximately 22,000,000 2.75-g chum salmon fry will be released into Big Kitoi Bay in 2008 using a non-volitional release technique for 85% of the chum fry; the remaining 15% of the fry will move volitionally to the saltwater net pens.

Applying an average of 3.0% stocking-to-adult return survival to the 2008 release, about 660,000 adult chum salmon are expected to return from 2010 through 2012 (Tables 2 and 6). The majority of the return is expected in 2011 (age 0.3 chum salmon).

COHO SALMON: BIG KITOI CREEK STOCK

About 1,000,000 BY 2006 juvenile coho salmon are being raised at KBH and will be released as 20.0-g smolt into Big Kitoi Bay in 2008 (Tables 1 and 6). The 2008 smolt release should result in 160,000 adults returning in 2009. Approximately 6,000 of the 149,000 adults returning to KBH in 2007 will be used as broodstock (Table 5). A total of 2,300,000 coho salmon eggs will be collected for future releases at five locations (Tables 6 and 7). From the egg take, approximately 1,300,000 green eggs will provide for 1,000,000 20.0-g smolt to be released from KBH in 2009 (Table 6). This release is expected to produce 160,000 (assuming a 16.0% survival) adults returning in 2010. Approximately 360,000 eggs that are collected will be for future releases at Jennifer (200,000 0.7-g fingerlings) and Ruth (30,000 0.7-g fingerlings) Lakes in 2008 (Table 7; Figure 4). These releases are expected to produce 4,600 (assuming a 2.0% survival) adults

returning in 2011 (Tables 2 and 7). The remaining 640,000 eggs collected will go towards planned releases into Crescent (165,000 0.7-g fingerlings) and Katmai Lakes (15,000 7.5-g presmolt) in 2008 (Table 7; Figures 1 and 5). Approximately 3,300 (assuming a 2.0% survival) adults should return in 2011 as a result of the Crescent Lake releases and 750 (assuming a 5.0% survival) adults should return in 2010 as a result of the Katmai Lake releases (Tables 2 and 7).

Most coho salmon returning to KBH and the Kitoi Bay area should be harvested in the commercial salmon fishery in the Duck, Izhut, and Kitoi Bay sections (Figure 3). The residents of nearby villages primarily harvest salmon returning from the Crescent Lake (Port Lions village) and Katmai Lake (Ouzinkie village) stocking projects during sport and subsistence fisheries. A portion of the Crescent Lake run may be available for commercial harvest in the Northwest Kodiak District (Figure 2) and the Settler Cove SHA (Figure 5; 5 AAC 18.364, 5 AAC 40.085(5)).

SOCKEYE SALMON: SALTERY LAKE STOCK

KBH will release 400,000 25.0-g presmolt (BY 2006) into LKL in May 2008 (using net pens to short term rear so that the smolt will imprint in LKL, prior to their release), which should result in approximately 60,000 adults returning from 2009 through 2011 (Tables 2 and 8).

Sockeye salmon eggs (600 broodstock; 600,000 eggs) will be collected from Saltery Lake or LKL (if an adequate number of adults return to LKL for an egg take) in 2007 to provide for the release of 100,000 9.0-g presmolt in October 2008 and 400,000 25.0-g presmolt in May 2009 into LKL (Table 8). Approximately 67,500 adults (assuming a 7.5% survival for fall presmolt and 15% survival for spring presmolt) are expected to return from 2010 through 2013 from these two releases (Tables 2 and 8).

The broodstock development program initiated at LKL was intended to provide sockeye salmon juveniles for annual stockings into Spiridon Lake. Sockeye salmon eggs have been collected at Saltery Lake to develop the program and eventually, when enough adults return to LKL, egg-take operations would be moved to LKL. The two-ocean adults from BY2005 that were reared in net pens in LKL are expected to account for the majority of the 2007 adult run. The 2007 forecast of approximately 72,000 fish returning to LKL should provide an adequate number of adults for an egg take to occur. KRAA estimated that 11,200 sockeye salmon will need to return to LKL to conduct an egg take. Because of the difficulty in beach seining for the brood stock, the manager's feel the minimum number of fish necessary to meet the egg take goals for the stocking projects is 5,600. If hatchery personnel are unable to pass 11,200 adult sockeye salmon into LKL, the egg take will take place at Saltery Lake. The decision to collect broodstock at LKL will be made by the middle of August as determined by escapement levels. PCH personnel will collect the broodstock and conduct an egg take at Saltery Lake or LKL in 2007 (Table 5).

SUMMARY OF EGG-TAKE GOALS IN 2007 AND RELEASES IN 2008 AND 2009

In summary, egg-take goals in 2007 are for: 180,000,000 pink salmon eggs (350,000 broodstock), 25,000,000 chum salmon eggs (30,000 broodstock), 2,300,000 coho salmon eggs (6,000 broodstock), and 600,000 sockeye salmon eggs (600 broodstock taken by Pillar Creek Hatchery personnel; Schrof and Byrne 2006; Tables 5-8). Releases planned for 2008 include: 145,000,000 pink salmon fry (BY 2007), 22,000,000 chum salmon fry (BY 2007), 1,000,000 coho salmon smolt (BY 2006), 395,000 coho fingerlings (BY 2007), 15,000 coho presmolt (BY 2007), and 500,000 sockeye salmon presmolt (400,000 BY 2006 and 100,000 BY 2007; Tables

6-8). An additional 1,000,000 coho salmon smolt (BY 2007) and 400,000 sockeye salmon presmolt (BY 2007) will be released in 2009.

SALMON HARVEST MANAGEMENT

ADULT SALMON FORECASTS FOR 2007

Approximately 4,700,000 pink salmon, 415,000 chum salmon, 149,000 coho salmon, and 72,000 sockeye salmon are expected to return to Kitoi Bay in 2007 as a result of previous releases of juvenile salmon from KBH (Table 5). Once broodstock and escapement needs are met, we anticipate approximately 4,350,000 pink salmon, 383,000 chum salmon, 143,000 coho salmon, and 61,000 sockeye salmon will be available for harvest in the Kitoi, Izhut and Duck Bay sections in 2007. The majority of these returning fish will be available to the common property fishery. However, KBH plans to harvest approximately 1,900,000 pink salmon for cost recovery.

KITOI BAY

The Kitoi Bay harvest strategy, as described in the Eastside Afognak Management Plan (5 AAC 18.365), is designed to increase fishing opportunities for the commercial salmon net fishery in the Duck, Izhut, and Kitoi Bays sections (Figure 3) while providing for adequate broodstock to KBH. Inseason management of KBH salmon runs is complicated because of overlapping run timing between species and the broodstock priorities (Figure 6). Therefore, inseason adjustments to fishing periods in any or all management units may be necessary. These adjustments may occur more frequently in the Kitoi Bay sections (Kitoi Bay SHA) and less frequently in the Duck Bay Section. During the broodstock collection periods, the burden of achieving adequate broodstock while maintaining high quality harvests on hatchery bound returns will be shared by the Kodiak Salmon Area Management Biologist and the Kitoi Bay Hatchery Manager. However, the area management biologist has the authority to open and close the salmon fisheries.

The KRAA Board of Directors decided to commence cost recovery fisheries beginning in 2003, to establish methods of operation and supplement the declining balance of the Kitoi Fund. The fund, which was established in 1989, had sustained the organization since the beginning of its operation of Kitoi Bay Hatchery. In 2007, KRAA seeks to derive funds from cost recovery fisheries to supplement hatchery operations in a similar fashion as in previous years. Cost recovery fisheries previously occurred in the Kitoi Bay Section from 1987 to 1989 and from 2003 to 2006. The harvest goal for 2007 cost recovery will be approximately 7,000,000 pounds of pink salmon (Honnold and Aro 2004 and 2005). Vessels will again be contracted to catch and deliver the fish to processors having bids approved by the KRAA Board of Directors. Contract vessels may use atypical purse seine gear in the Kitoi Bay SHA upon approval of ADF&G. Kitoi Bay SHA has been established (5 AAC 40.085(1)) as the Inner and Outer Kitoi Bay sections or all waters of Kitoi Bay west of a line from 58° 09.50' N. lat., 152° 18.70' W. long. (Wadle 2007; Figure 4).

Pink Salmon

Pink salmon produced at KBH are harvested in commercial purse seine fisheries in the Duck, Izhut, and Kitoi Bay sections (Figures 3 and 4). The pink salmon return begins in mid July, peaks in early to mid August, and ends in late August to early September (Figure 6). The initial fishery opening for pink salmon is expected in late July and is designed to harvest excess males, which arrive during the early portion of the run (Wadle 2007). Broodstock will be collected throughout the run, once it is composed of at least 60% female fish. Spawning pairs will be randomly

selected during the egg takes to maximize genetic variability. In order to harvest pink salmon in excess of the hatchery broodstock needs (350,000 adults; Table 5), additional openings may occur.

Depending on run strength and timing, the Inner and Outer Kitoi, Izhut, and Duck Bay sections may close to commercial salmon fishing from July 20 through September 5 to allow for pink salmon broodstock collection and cost recovery fisheries (Wadle 2007; Figures 3 and 6). The cost recovery operations will most likely occur between August 1st and August 20th. The common property fishery will remain open during the beginning of the pink return to assess run timing and strength before the cost recovery fishery is opened. This is intended to maximize common property fishing opportunities at the beginning and end of the run and result in a condensed and efficient cost recovery fishery. The pink salmon broodstock is collected by mid-August. Once the pink salmon broodstock is collected and contained behind the barrier net enclosure, additional commercial fishing time may be allowed inside Kitoi Bay SHA depending on the progress of the cost recovery fishery (Figure 4). Fishing periods are coordinated between the Kitoi Bay Hatchery Manager and the Kodiak Area Management Biologist to ensure adequate broodstock, while maintaining an orderly cost recovery and commercial fishery. Escapement goals have not been formally established for Big Kitoi Creek; however, pink salmon escapement is monitored by KBH staff and about 15,000 pink salmon annually spawn in the creek (Table 5).

Chum Salmon

Chum salmon produced at KBH are taken in commercial purse seine fisheries in the Izhut, Duck, and Kitoi Bay sections (Figure 3). The chum salmon run begins in early June, peaks in late June to early July, and ends in early August (Figure 6). The initial chum salmon commercial opening in the Duck Bay Section will occur on June 5, 2007 (Wadle 2007). In order to harvest adults in excess of hatchery broodstock needs, additional openings in these sections may occur as run strength is determined. Most of the chum salmon needed for broodstock (30,000 adults; Table 5) are expected to be in the Inner Kitoi Bay Section by mid July (Figures 3 and 4). Broodstock are retained by a barrier net enclosure in Big Kitoi Bay (Figure 4). Once all chum salmon broodstock are contained behind the barrier net, additional commercial fishing time may occur in the Kitoi Bay SHA. The chum salmon egg take is expected to occur from early July through early August.

The Hatchery Manager and the Kodiak Area Management Biologist will coordinate openings in the Duck, Izhut, and Kitoi Bay sections to minimize the harvest of chum salmon during the late July pink salmon fisheries. Escapement goals have not been formally established for Big Kitoi Creek; however, chum salmon escapement is monitored by KBH staff and about 2,000 chum salmon annually spawn in the creek (Table 5).

Coho Salmon

Coho salmon produced at KBH are harvested in commercial purse and beach seine fisheries in the Duck, Izhut, and Kitoi Bay sections (Figure 3). The coho salmon run is expected to start in late July, peak in late August, and continue through the beginning of September (Figure 6). The majority of the coho will be harvested incidental to the pink salmon fishery in the Kitoi Bay area as well as in directed coho fisheries in late August and early September. Hatchery broodstock (6,000 adults; Table 5) will be collected throughout the coho salmon run. In the past, a specific commercial fishing closure has not been necessary to ensure adequate broodstock. The run strength in 2007 is estimated to be substantially larger than broodstock requirements; therefore, specific commercial fishing closures are not expected to occur (Wadle 2007). Coho salmon

broodstock are incidentally collected during the pink broodstock collection and after the commercial fisheries are generally over and do not require the use of the barrier net.

There are three distinct areas where fishing is either prohibited year-round or restricted between August 15 and September 30 (Figures 3 and 4; 5 AAC 18.350; 5 AAC 64.022(b)). These closed waters areas are intended to improve broodstock collection efforts near the hatchery and are used as a precautionary measure to resolve potential conflicts between hatchery broodstock needs and subsistence and recreational fisheries.

Coho salmon returning to Jennifer and Ruth lakes will also be harvested during commercial fisheries in Duck, Izhut, and Kitoi Bay sections (Figure 3). All of the coho salmon bound for these lakes will be available for harvest. Fish that are not harvested at Jennifer and Ruth Lakes have access to the lower portion of the outlet streams, so they are not expected to stray.

Coho salmon will be able to enter LKL beginning the first week of September to provide escapement (approximately 500 salmon; Table 5) and to prevent straying. Although the coho salmon peak run timing is later than the pink salmon peak, most of the coho will be harvested during fisheries targeting pink salmon.

Sockeye Salmon

The sockeye salmon run should begin in late June and continue through mid August with the peak occurring during the first two weeks of July (Figure 7). The 2007 run (Saltery Lake stock) is forecast to be stronger than in past years with the first two- and three-ocean net pen reared fish returning. Based on the forecasted run of 72,000 sockeye salmon, the run should provide enough returning adults to LKL to begin broodstock collection for the Spiridon Lake enhancement program. However, an in-season assessment will be conducted and commercial fishery closures inside the Kitoi Bay SHA will occur to allow LKL bound sockeye salmon access to the lake (Wadle 2007).

CRESCENT LAKE

Coho Salmon

The purpose of the Crescent Lake coho salmon stocking project is to provide enhanced coho salmon for harvest as they return to Crescent Lake (Figure 5; 5 AAC 18.364). Most of the 2007 coho salmon run will be harvested in the local sport and subsistence fishery; however, a portion of the run may be available for commercial harvest. The commercial harvest of Crescent Lake coho salmon is expected to occur during normal fishing periods targeting coho salmon in the Northwest Kodiak District (Figure 2). Special openings are not expected to occur within the Settler Cove SHA (Figure 5; 5 AAC 40.085). Natural barriers prevent salmon access to Crescent Lake, so all returning coho salmon will be available for harvest. Some fish can escape into the lower portion of the outlet stream, but will be utilized by villagers from Port Lions for subsistence purposes. Harvest information will be obtained from the ADF&G subsistence permit and commercial fish ticket programs to estimate contributions from the stocking project.

KATMAI LAKE

Coho Salmon

The purpose of the Katmai Lake coho salmon stocking project is to provide adult returns for harvest by sport and subsistence fishers in the vicinity of Ouzinkie Village (Figure 1). This project is also intended to provide students in Ouzinkie Village with a community and educational project assisting in the release of the presmolt. Most coho salmon returning to

Katmai Lake will be harvested in the local sport and subsistence fishery. Some may also be harvested in commercial fisheries in the Northwest Kodiak District (Figure 2). Natural barriers prevent salmon access to Katmai Lake, so all returning coho salmon will be available for harvest (Table 5). Fish that congregate in the outlet stream are prevented from straying since the villagers of Ouzinkie utilize the entire escapement for subsistence purposes. Harvest information will be obtained from the ADF&G subsistence permit and commercial fish ticket programs to estimate contributions from the stocking project.

ADDITIONAL MEASURES FOR WILDSTOCK PROTECTION

GENETICS POLICY

The ADF&G Genetics policy is designed to ensure that stocking projects do not negatively impact the genetic integrity of wild stocks (McGee 1995). The policy addresses three primary areas: 1) stock transport, 2) protection of wild stocks, and 3) maintenance of genetic variability. This policy, as described in the 2001 KBH annual management plan (McCullough and Aro 2001), will be followed in 2007 for all projects.

To protect wild stocks and maintain genetic variability, adults produced from hatchery stocking projects must be prevented from straying into stream and lake systems supporting wild stocks. A management strategy targeting enhanced production is required by ADF&G to ensure compliance with state regulations for private nonprofit (PNP) salmon hatcheries (5 AAC 40.005 (f)). This strategy must address ADF&G PNP permitting requirements for salmon straying concerns and include detailed actions required when harvest of enhanced production is delayed or abandoned.

These actions were detailed in an unplanned cost recovery operational plan (UCROP) as part of the PCH annual management plan in 2003 and included cost recovery fisheries in the Terminal Harvest Areas (THAs currently SHAs; Honnold and Clevenger 2003). If commercial fishing does not occur for some reason in 2007, salmon returning to the Kitoi Bay SHA will be harvested using the guidelines described in the UCROP.

POLICIES AND GUIDELINES FOR HEALTH AND DISEASE CONTROL

The State of Alaska Pathology Review Committee has developed a long range goal to prevent dissemination of infectious finfish (and shellfish) disease within or outside the borders of Alaska (McGee 1995). This goal is intended to protect stocks without constraining aquaculture or stock renewal programs. The policy and guidelines do not advocate transplanting wild finfish stocks between geographic zones in attempt to minimize risk of transporting disease from one zone to another. In addition, this policy includes hatchery stocks in order to be consistent with the Genetics policy. Some exceptions may be made on a case by case basis. The policy and guidelines for health and disease control, as described in the 2001 Kitoi Bay Hatchery Annual Management Plan (McCullough and Aro 2001) will be followed in 2007 for all projects.

EVALUATION

In FY 2003, the evaluation program and all the field operation responsibilities were transferred from ADF&G to Kodiak Regional Aquaculture Association personnel. The objectives of the evaluation program have essentially remained unchanged and include: 1) monitoring salinity, temperature, and plankton bloom data in Kitoi Bay during saltwater rearing periods for juvenile pink, chum, and coho

salmon, 2) estimating the age structure of chum salmon returning to the hatchery, 3) collecting baseline age and growth data from coho and sockeye presmolt and smolt reared at KBH, 4) estimating the number of sockeye salmon smolt outmigrating from LKL, 5) estimating the survival of the sockeye salmon presmolt stocked into LKL, 6) estimating the average age, weight, and length (AWL) composition of the sockeye salmon smolt outmigrating from LKL, and 7) estimating the zooplankton density and biomass in Little Kitoi, Upper and Lower Jennifer, and Ruth lakes (Schrof 2002).

PINK, CHUM, AND COHO SALMON

Plankton tows will be conducted in Kitoi Bay to ascertain the timing of plankton blooms and to assess general ocean conditions prior to the release of pink and chum salmon fry. Chum salmon size, sex, and age (scales) data will be collected throughout the run to develop a more complete and representative age class record. Age, length, and sex data will be collected from the escapement (600 adults) to Big Kitoi Creek and from the Kitoi Bay area commercial harvest (600 adults; McCullough and Aro 2002). These data will be used to assign ages to the adult chum salmon run and estimate overall survival by release year. Prior to saltwater rearing, coho salmon smolt will be sampled for weight, length, and condition data and evaluated for their ability to osmoregulate (ability to maintain proper water and electrolyte balance in saltwater). The latter assessment will include holding small numbers of juveniles in the net pens used for rearing in saltwater and recording mortality. This will be repeated until mortality is minimal (<1%). Once this occurs, the remaining smolt will be transferred to the net pens for saltwater rearing.

SOCKEYE SALMON

The sockeye salmon evaluation program will continue to focus on assessing production from LKL presmolt releases. In 2007, we will rear 380,000 presmolt (BY 2005) in net pens to allow them time to imprint in LKL and release them to coincide with the peak outmigration of the resident sockeye salmon smolt. We will also collect 200 random scale samples prior to non-volitional release from net pens into Little Kitoi Bay. These presmolt should average about 25.0-g and should have significantly different scale patterns than the presmolt released into LKL in the fall. In 2007, we will also release 100,000 fall presmolt (BY 2006) into LKL at the beginning of October. In 2007 a portion of the sockeye salmon released (10% of the fall release into LKL) will be marked prior to release by fin clipping to determine survival and age composition of future emigrations from LKL. Returning adult sockeye salmon will be examined for fin clips and sampled at LKL fish ladder.

All sockeye salmon caught in the LKL fish pass, cost recovery or sport fishery or the hatchery raceways will be examined for marks and scales, and fish lengths will be taken. Scales taken from adults without marks will be aged and the scale patterns will be compared to LKL sockeye scale patterns. The scale data will be used to reconstruct age components of the yearly returns.

Limnology data will be collected in 2007 from Little Kitoi, Upper and Lower Jennifer, and Ruth Lakes and salinity, temperature, and plankton data will be collected from Big and Little Kitoi Bays.

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We acknowledge the KRAA Director, Kevin Brennan and all KRAA permanent and seasonal personnel at Kitoi Bay Hatchery. We also acknowledge the ADF&G personnel that contributed to the management plan including Lisa Marcato for her publication expertise, Joe Dinnocenzo, Leslie Watson, and Steve Honnold for their editorial comments.

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TABLES AND FIGURES

Table 1.—Kitoi Bay Hatchery pink, chum, and coho salmon egg takes in 2005 and 2006, juvenile releases planned for Big Kitoi Bay in 2007 and 2008, projected adult production and fish transport permit (FTP) information.

| Fish Species | Pink Salmon | Chum Salmon | Coho Salmon | Coho Salmon |
|---------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Brood Year | 2006 | 2006 | 2005 | 2006 |
| Broodstock | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek |
| <u>Egg take</u> | | | | |
| eggs | 181,812,203 | 29,206,979 | 1,200,000 | 1,200,000 |
| adults | 331,816 | 34,906 | 3,120 | 3,120 |
| <u>Releases</u> | | | | |
| location | Big Kitoi Bay | Big Kitoi Bay | Big Kitoi Bay | Big Kitoi Bay |
| number | 142,000,000 | 21,200,000 | 1,060,000 | 1,000,000 |
| size (g) | 0.65 | 2.5 | 20.0 | 20.0 |
| lifestage | fed fry | fed fry | smolt | smolt |
| date | 25-May-07 | 25-May-07 | 01-Jun-07 | 31-May-08 |
| <u>Projected Returns</u> ^a | | | | |
| 2008 | 4,544,000 | 0 | 169,600 | 0 |
| 2009 | 0 | 76,320 | 0 | 160,000 |
| 2010 | 0 | 483,360 | 0 | 0 |
| 2011 | 0 | 76,320 | 0 | 0 |
| 2012 | 0 | 636 | 0 | 0 |
| total | 4,544,000 | 636,636 | 169,600 | 160,000 |
| <u>Fish Transport Permit</u> | | | | |
| number | 06A-0073 | 06A-0072 | 02A-0007 | 02A-0007 |
| expires | 31-Aug-11 | 31-Aug-11 | 01-May-12 | 01-May-12 |
| max. no. | 215,000,000 | 25,000,000 | 1,300,000 | 1,300,000 |
| lifestage | G.Eggs | G.Eggs | G. Eggs | G. Eggs |
| number | 06A-0073 | 06A-0072 | 02A-0007 | 02A-0007 |
| expires | 31-Aug-11 | 31-Aug-11 | 01-May-12 | 01-May-12 |
| max. no. | 182,000,000 | 22,000,000 | 1,000,000 | 1,000,000 |
| lifestage | Fry | Fry | Smolt | Smolt |

^a Projected returns are calculated from Table 2 survival and age assumptions.

Table 2.—Salmon survival and age assumptions used to estimate returns for Kitoi Bay Hatchery.

| | Stocking | | Size | Survival ^a | Age-at-return Proportions (%) ^a | | | | | | | | | | | | |
|---------|----------|-------------------------|------|-----------------------|--|------|------|-----|------|-----|------|------|-----|------|------|-----|------|
| | Year | Life Stage ^b | | | Stocking-to-adult return | 0.1 | 0.2 | 1.1 | 0.3 | 1.2 | 2.1 | 0.4 | 1.3 | 2.2 | 0.5 | 2.3 | |
| Species | | | (g) | | | | | | | | | | | | | | |
| | Pink | even | F | 0.7 | 4.55% | 1.00 | | | | | | | | | | | |
| | | odd | F | 0.7 | 5.33% | | | | | | | | | | | | |
| | Chum | all | F | 2.8 | 3.00% | | 0.12 | | 0.76 | | | 0.12 | | | 0.00 | | |
| | Coho | all | FG | 0.7 | 2.00% | | | | | | 1.00 | | | | | | |
| | Coho | all | FPS | 7.5 | 5.00% | | | | 1.00 | | | | | | | | |
| | Coho | all | S | 20 | 16.00% | | | | 1.00 | | | | | | | | |
| | Sockeye | all | FPS | 9 | 7.50% | | | | 0.01 | | 0.31 | 0.01 | | 0.39 | 0.24 | | 0.05 |
| | Sockeye | all | SPS | 20 | 15.00% | | | | 0.02 | | 0.55 | | | 0.44 | | | |

^a Based on actual survival and age-at-return data from Kitoi Bay Hatchery and/or other ADF&G research projects; chum fry were a larger size at release, which are expected to increase survival; pink salmon survival the last four even years was 4.55% and the average odd year survival for pink salmon was 5.33%.

^b F=fry, FG=fingerling, FPS= fall presmolt, S=smolt, and SPS=spring presmolt.

Table 3.—Kitoi Bay Hatchery coho salmon egg takes in 2006, juvenile releases planned for Jennifer, Ruth, Crescent, and Katmai lakes in 2007, projected adult production, and FTP information.

| Fish Species | Coho Salmon | Coho Salmon | Coho Salmon | Coho Salmon | Totals |
|---------------------------------------|-----------------|-----------------|-----------------|-----------------|---------|
| Brood Year | 2006 | 2006 | 2006 | 2006 | |
| Broodstock | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek | |
| <u>Egg take</u> | | | | | |
| eggs | 275,500 | 55,100 | 553,100 | 36,000 | 919,700 |
| adults | 1,600 | 300 | 3,200 | 200 | 5,300 |
| <u>Stocking</u> | | | | | |
| location | Jennifer Lake | Ruth Lake | Crescent Lake | Katmai Lake | |
| number | 200,000 | 30,000 | 165,000 | 15,000 | 410,000 |
| size (g) | 0.7 | 0.7 | 0.7 | 7.5 | |
| lifestage | fingerling | fingerling | fingerling | presmolt | |
| date | 20-Jun-07 | 20-Jun-07 | 20-Jun-07 | 01-Oct-07 | |
| <u>Projected Returns</u> ^a | | | | | |
| 2009 | 0 | 0 | 0 | 750 | 750 |
| 2010 | 4,000 | 600 | 3,300 | 0 | 7,900 |
| 2011 | 0 | 0 | 0 | 0 | 0 |
| total | 4,000 | 600 | 3,300 | 750 | 8,650 |
| <u>Fish Transport Permit</u> | | | | | |
| number | 02A-0009 | 02A-0011 | 02A-0008 | 02A-0010 | |
| expires | 01-May-12 | 01-May-12 | 15-May-12 | 01-May-12 | |
| max. no. | 300,000 | 60,000 | 600,000 | 40,000 | |
| lifestage | G. Eggs | G. Eggs | G. Eggs | G. Eggs | |
| number | 02A-0009 | 02A-0011 | 02A-0008 | 02A-0010 | |
| expires | 01-May-12 | 01-May-12 | 15-May-12 | 01-May-12 | |
| max. no. | 250,000 | 50,000 | 500,000 | 30,000 | |
| lifestage | Fingerlings | Fingerlings | Fingerlings | Presmolt | |

^a Projected returns are calculated from Table 2 survival and age assumptions.

Table 4.–Pillar Creek Hatchery sockeye salmon egg takes and egg transfer to Kitoi Bay Hatchery in 2005 and 2006, juvenile releases planned for Little Kitoi Lake in 2007 and 2008, projected adult production, and FTP information.

| Fish Species | Sockeye Salmon | Sockeye Salmon | Sockeye Salmon | Totals |
|---------------------------------------|-------------------|-------------------|-------------------|---------|
| Brood Year | 2005 | 2006 | 2006 | |
| Broodstock | Saltery Lake | Saltery Lake | Saltery Lake | |
| <u>Egg take</u> | | | | |
| eggs | 627,460 | 126,589 | 506,354 | 754,049 |
| adults | 627 | 119 | 474 | 1,220 |
| <u>Stocking</u> | | | | |
| location | Little Kitoi Lake | Little Kitoi Lake | Little Kitoi Lake | |
| number | 380,000 | 100,000 | 400,000 | 880,000 |
| size (g) | 25.00 | 9.00 | 25.00 | |
| lifestage | presmolt | presmolt | presmolt | |
| date | 29-May-07 | 01-Oct-07 | 29-May-08 | |
| <u>Projected Returns</u> ^a | | | | |
| 2008 | 912 | 0 | 0 | 912 |
| 2009 | 31,065 | 38 | 960 | 32,063 |
| 2010 | 25,023 | 2,385 | 32,700 | 60,108 |
| 2011 | 0 | 4,665 | 26,340 | 31,005 |
| 2012 | 0 | 405 | 0 | 405 |
| total | 57,000 | 7,493 | 60,000 | 124,493 |
| <u>Fish Transport Permit</u> | | | | |
| number | 97A-0068 | 97A-0068 | 97A-0068 | |
| expires | 31-Dec-08 | 31-Dec-08 | 31-Dec-08 | |
| max. no. | 1,200,000 | 1,200,000 | 1,200,000 | |
| lifestage | G.Eggs | G.Eggs | G.Eggs | |
| number | 05A-0078 | 05A-0078 | 05A-0078 | |
| expires | 12-Jun-10 | 12-Jun-10 | 12-Jun-10 | |
| max. no. | 500,000 | 500,000 | 500,000 | |
| lifestage | Presmolt | Presmolt | Presmolt | |

^a Projected returns are calculated from Table 2 survival and age assumptions.

Table 5.—Forecasted runs, broodstock requirements, minimum escapements, and potential harvest of salmon returning to systems in 2007 as a result of prior Kitoi Bay Hatchery stockings.

| Return Location | Species | Forecasted Run | | | Broodstock Required | Minimum Escapement ^a | Potential Harvest ^b |
|---|----------------------|----------------|-----------|-----------|------------------------|------------------------------------|-----------------------------------|
| | | Point | Low | High | | | |
| Kitoi Bay Hatchery (Big Kitoi Creek) | Pink | 4,712,000 | 3,815,000 | 5,251,000 | 350,000 | 15,000 | 4,347,000 |
| | Chum | 415,000 | 311,000 | 519,000 | 30,000 | 2,000 | 383,000 |
| | Coho | 149,400 | 125,600 | 195,000 | 6,000 | 0 | 143,400 |
| Little Kitoi Lake | Sockeye ^c | 71,900 | 57,900 | 85,900 | 11,200 | 0 | 60,700 |
| | Coho | 1,000 | | | 0 | 500 | 500 |
| Crescent Lake | Coho | 3,300 | 2,475 | 4,125 | 0 | 0 | 3,300 |
| Katmai Creek | Coho | 750 | 563 | 938 | 0 | 0 | 750 |
| Saltery Lake ^d | Sockeye | | | | 5,600 | 11,200 | |

^a Minimum escapement for BKC refers to the number of adults remaining in the creek after KBH has completed the egg takes. These fish are allowed entry into the creek to spawn to continue the run in the event of the loss of the hatchery rearing fish.

^b Projected harvest is the run minus broodstock and escapement needs.

^c Egg take may occur in 2007, if sufficient adults are counted through the fish pass into the lake. Returns of sockeye salmon (Saltery Lake broodstock) will not be targeted for harvest. Eggs may be transferred to Pillar Creek Hatchery for stocking of Spiridon Lake in 2007. Broodstock numbers include 5,000 adults for Pillar Creek Hatchery (Spiridon Lake stocking) and 600 adults for KBH for continued broodstock development (Little Kitoi Lake stocking). Assumption is that only 50% of LKL escapement may be available for an egg take.

^d Saltery Lake egg take will occur, if insufficient adults are available for a Little Kitoi egg take.

Table 6.–Proposed 2007 Kitoi Bay Hatchery pink, chum, and coho salmon egg takes and juvenile releases for Big Kitoi Bay in 2008 and 2009.

| Fish Species | Pink Salmon | Chum Salmon | Coho Salmon | Coho Salmon |
|---------------------------------------|-----------------|-----------------|-----------------|-----------------|
| Brood Year | 2007 | 2007 | 2006 | 2007 |
| Broodstock | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek |
| <u>Egg take</u> | | | | |
| eggs | 180,000,000 | 25,000,000 | 1,300,000 | 1,300,000 |
| adults | 350,000 | 30,000 | 3,360 | 3,360 |
| <u>Releases</u> | | | | |
| location | Big Kitoi Bay | Big Kitoi Bay | Big Kitoi Bay | Big Kitoi Bay |
| number | 145,000,000 | 22,000,000 | 1,000,000 | 1,000,000 |
| size (g) | 0.75 | 2.75 | 20.0 | 20.0 |
| lifestage | fed fry | fed fry | smolt | smolt |
| date | 23-May-08 | 23-May-08 | 31-May-08 | 31-May-09 |
| <u>Projected Returns</u> ^a | | | | |
| 2009 | 13,000,000 | 0 | 160,000 | 0 |
| 2010 | 0 | 79,200 | 0 | 160,000 |
| 2011 | 0 | 501,600 | 0 | 0 |
| 2012 | 0 | 79,200 | 0 | 0 |
| 2013 | 0 | 0 | 0 | 0 |
| total | 13,000,000 | 660,000 | 160,000 | 160,000 |
| <u>Fish Transport Permit</u> | | | | |
| number | 06A-0073 | 06A-0072 | 02A-0007 | 02A-0007 |
| expires | 31-Aug-11 | 31-Aug-11 | 01-May-12 | 01-May-12 |
| max. no. | 215,000,000 | 25,000,000 | 1,300,000 | 1,300,000 |
| lifestage | G.Eggs | G.Eggs | G. Eggs | G. Eggs |
| number | 01A-0102 | 01A-0103 | 02A-0007 | 02A-0007 |
| expires | 30-Aug-06 | 31-Aug-06 | 01-May-12 | 01-May-12 |
| max. no. | 182,000,000 | 22,000,000 | 1,000,000 | 1,000,000 |
| lifestage | Fry | Fry | Smolt | Smolt |

^a Projected returns are calculated from Table 2 survival and age assumptions.

Table 7.–Proposed 2007 Kitoi Bay Hatchery coho salmon egg takes, juvenile releases planned for Jennifer, Ruth, Crescent, and Katmai lakes in 2008, projected adult production, and FTP information.

| Fish Species | Coho Salmon | Coho Salmon | Coho Salmon | Coho Salmon | Totals |
|---------------------------------------|-----------------|-----------------|-----------------|-----------------|-----------|
| Brood Year | 2007 | 2007 | 2007 | 2007 | |
| Broodstock | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek | Big Kitoi Creek | |
| <u>Egg take</u> | | | | | |
| eggs | 300,000 | 60,000 | 600,000 | 40,000 | 1,000,000 |
| adults | 780 | 180 | 1,560 | 120 | 2,640 |
| <u>Stocking</u> | | | | | |
| location | Jennifer Lake | Ruth Lake | Crescent Lake | Katmai Lake | |
| number | 200,000 | 30,000 | 165,000 | 15,000 | 410,000 |
| size (g) | 0.7 | 0.7 | 0.7 | 7.5 | |
| lifestage | fingerling | fingerling | fingerling | presmolt | |
| date | 20-Jun-08 | 20-Jun-08 | 20-Jun-08 | 01-Oct-08 | |
| <u>Projected Returns</u> ^a | | | | | |
| 2010 | 0 | 0 | 0 | 750 | 750 |
| 2011 | 4,000 | 600 | 3,300 | 0 | 7,900 |
| 2012 | 0 | 0 | 0 | 0 | 0 |
| total | 4,000 | 600 | 3,300 | 750 | 8,650 |
| <u>Fish Transport Permit</u> | | | | | |
| number | 02A-0009 | 02A-0011 | 02A-0008 | 02A-0010 | |
| expires | 01-May-12 | 01-May-12 | 15-May-12 | 01-May-12 | |
| max. no. | 300,000 | 60,000 | 600,000 | 40,000 | 1,000,000 |
| lifestage | G. Eggs | G. Eggs | G. Eggs | G. Eggs | |
| number | 02A-0009 | 02A-0011 | 02A-0008 | 02A-0010 | |
| expires | 01-May-12 | 01-May-12 | 15-May-12 | 01-May-12 | |
| max. no. | 250,000 | 50,000 | 500,000 | 30,000 | 830,000 |
| lifestage | Fingerlings | Fingerlings | Fingerlings | Presmolt | |

^a Projected returns are calculated from Table 2 survival and age assumptions.

Table 8.—Proposed Pillar Creek Hatchery sockeye salmon egg takes and egg transfer to Kitoi Bay Hatchery in 2006 and 2007, juvenile releases planned for Little Kitoi Lake in 2008 and 2009, projected adult production, and FTP information.

| Fish Species | Sockeye Salmon | Sockeye Salmon | Sockeye Salmon | Total |
|---|-------------------|-------------------|-------------------|-----------|
| Brood Year | 2006 | 2007 | 2007 | |
| Broodstock | Saltery Lake | Saltery Lake | Saltery Lake | |
| <u>Egg take</u> | | | | |
| eggs | 632,943 | 120,000 | 480,000 | 1,232,943 |
| adults | 593 | 100 | 500 | 1,193 |
| <u>Stocking</u> | | | | |
| location | Little Kitoi Lake | Little Kitoi Lake | Little Kitoi Lake | |
| number | 400,000 | 100,000 | 400,000 | 900,000 |
| size (g) | 25.00 | 9.00 | 25.00 | |
| lifestage | presmolt | presmolt | presmolt | |
| date | 27-May-08 | 01-Oct-08 | 27-May-09 | |
| <u>Projected Returns</u> ^a | | | | |
| 2009 | 960 | 0 | 0 | 960 |
| 2010 | 32,700 | 38 | 960 | 33,698 |
| 2011 | 26,340 | 2,385 | 32,700 | 61,425 |
| 2012 | 0 | 4,665 | 26,340 | 31,005 |
| 2013 | 0 | 405 | 0 | 405 |
| total | 60,000 | 7,493 | 60,000 | 127,493 |
| <u>Fish Transport Permit</u> ^b | | | | |
| number | 97A-0068 | 97A-0068 | 97A-0068 | |
| expires | 31-Dec-08 | 31-Dec-08 | 31-Dec-08 | |
| max. no. | 1,200,000 | 1,200,000 | 1,200,000 | 3,600,000 |
| lifestage | G.Eggs | G.Eggs | G.Eggs | |
| number | 05A-0078 | 05A-0078 | 05A-0078 | |
| expires | 12-Jun-10 | 12-Jun-10 | 12-Jun-10 | |
| max. no. | 100,000 | 100,000 | 400,000 | 600,000 |
| lifestage | Presmolt | Presmolt | Presmolt | |

^a Projected returns are calculated from Table 2 survival and age assumptions.

^b FTP 02A-0060 is in the process of being amended to provide for presmolt releases at the planned levels.

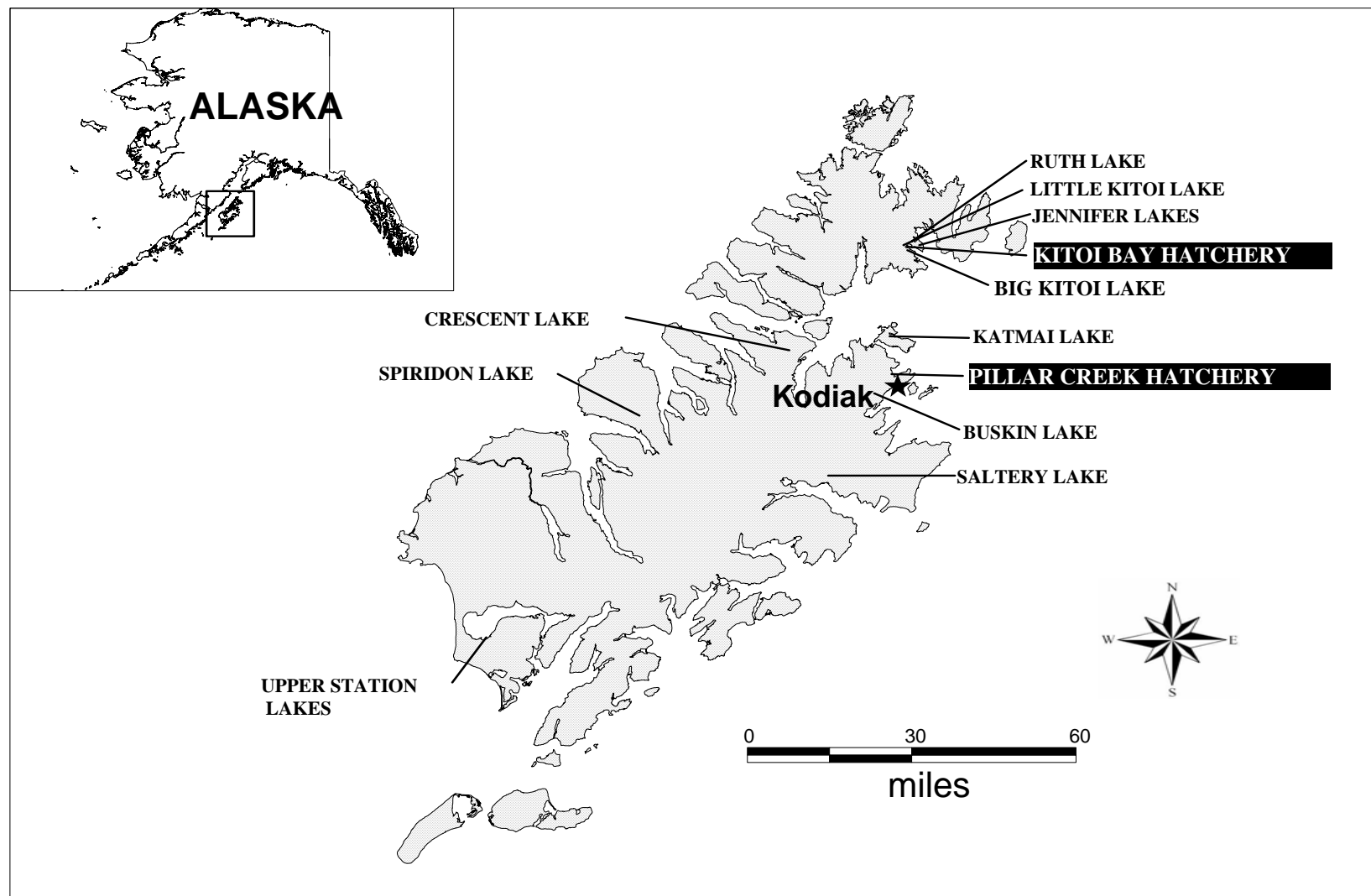


Figure 1.—Locations of salmon stocking and enhancement projects associated with Kitoi Bay Hatchery on Kodiak and Afognak Islands.

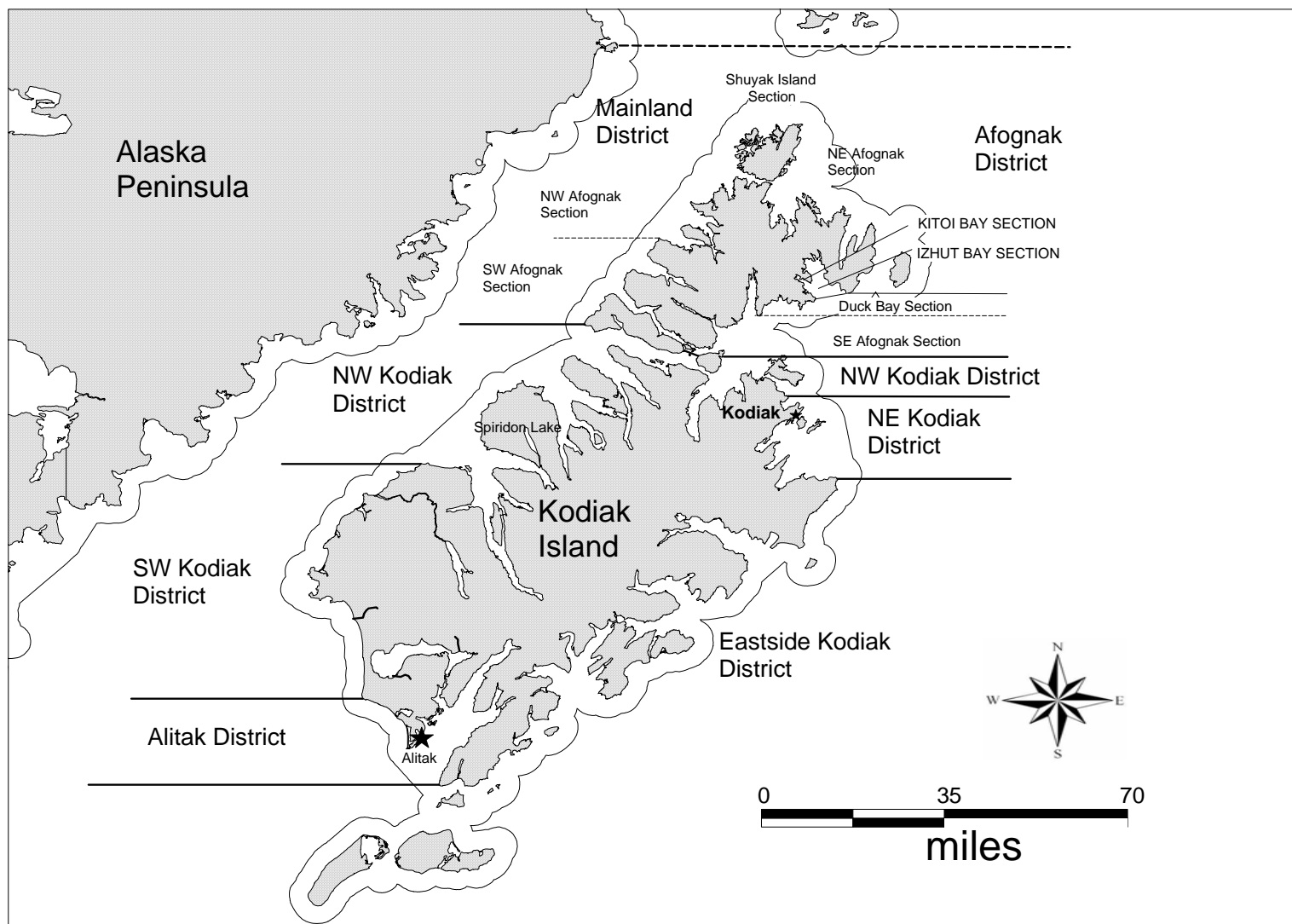


Figure 2.—Map of the Kodiak Management Area depicting commercial fishing districts and selected sections around Kodiak, Afognak, and Shuyak Islands.

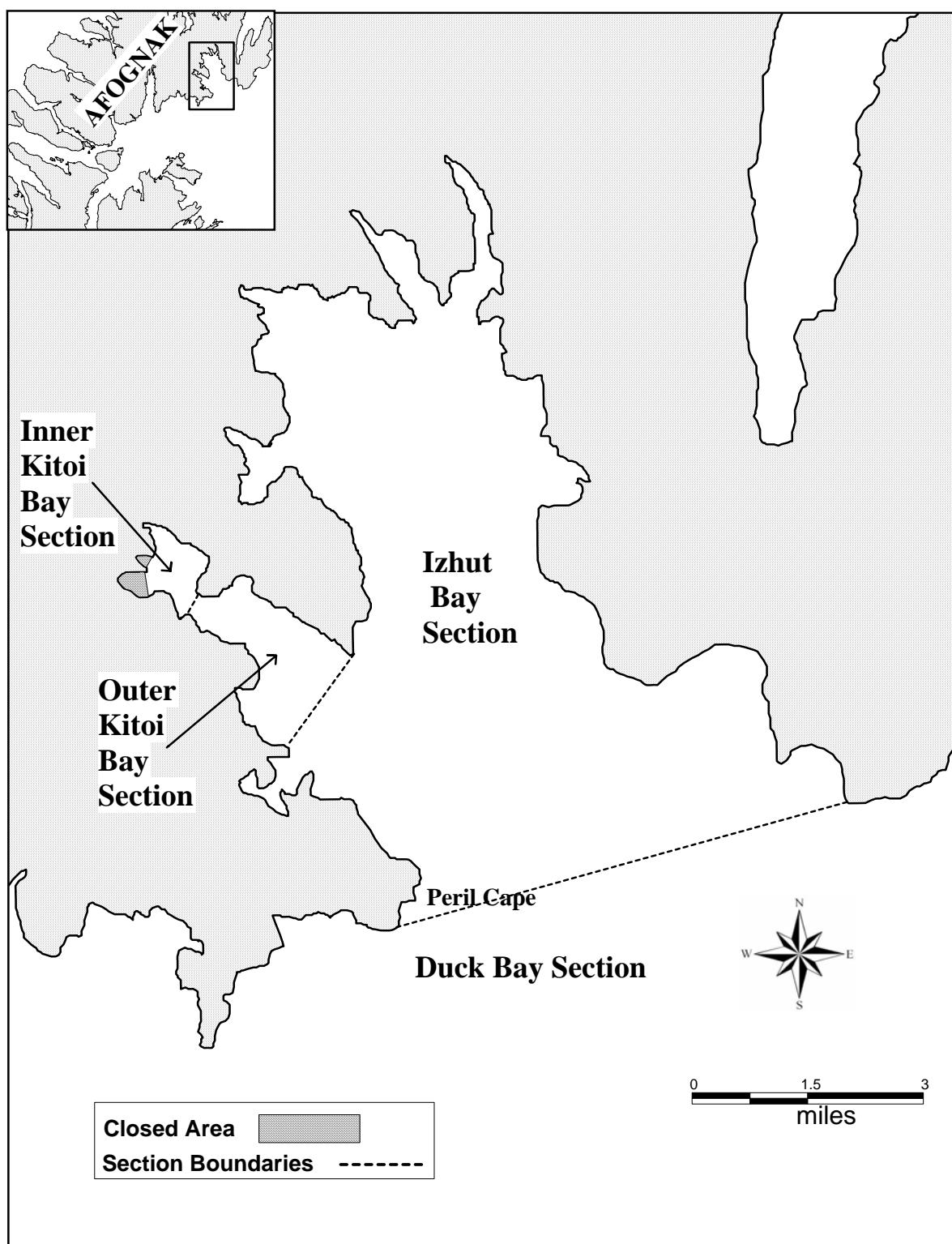


Figure 3.—Map of Izhut (252-30), Duck (252-31), and Inner and Outer Kitoi Bay (252-32) Sections.

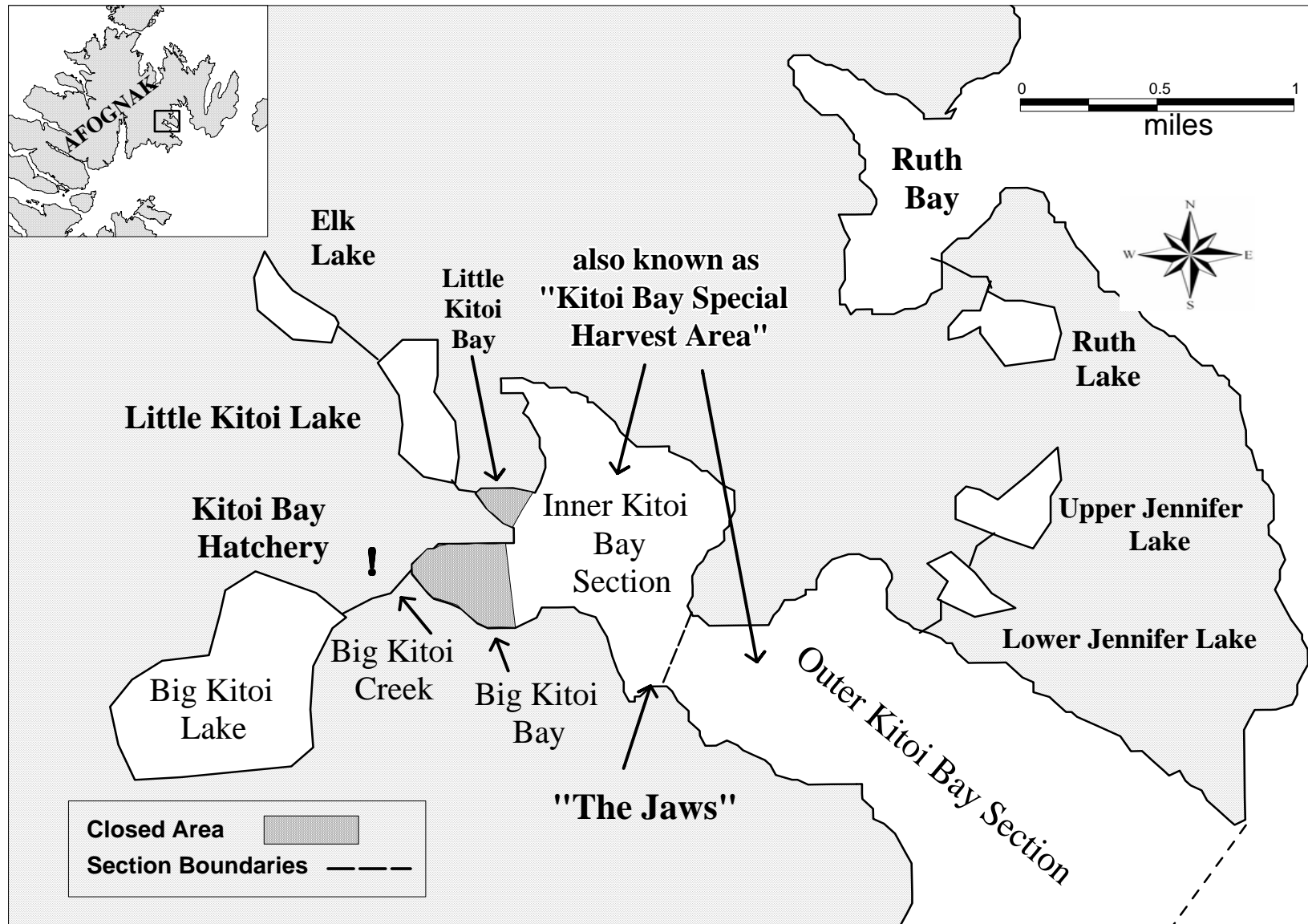


Figure 4.—Map of Inner and Outer Kitoi Bay Sections (252-32).

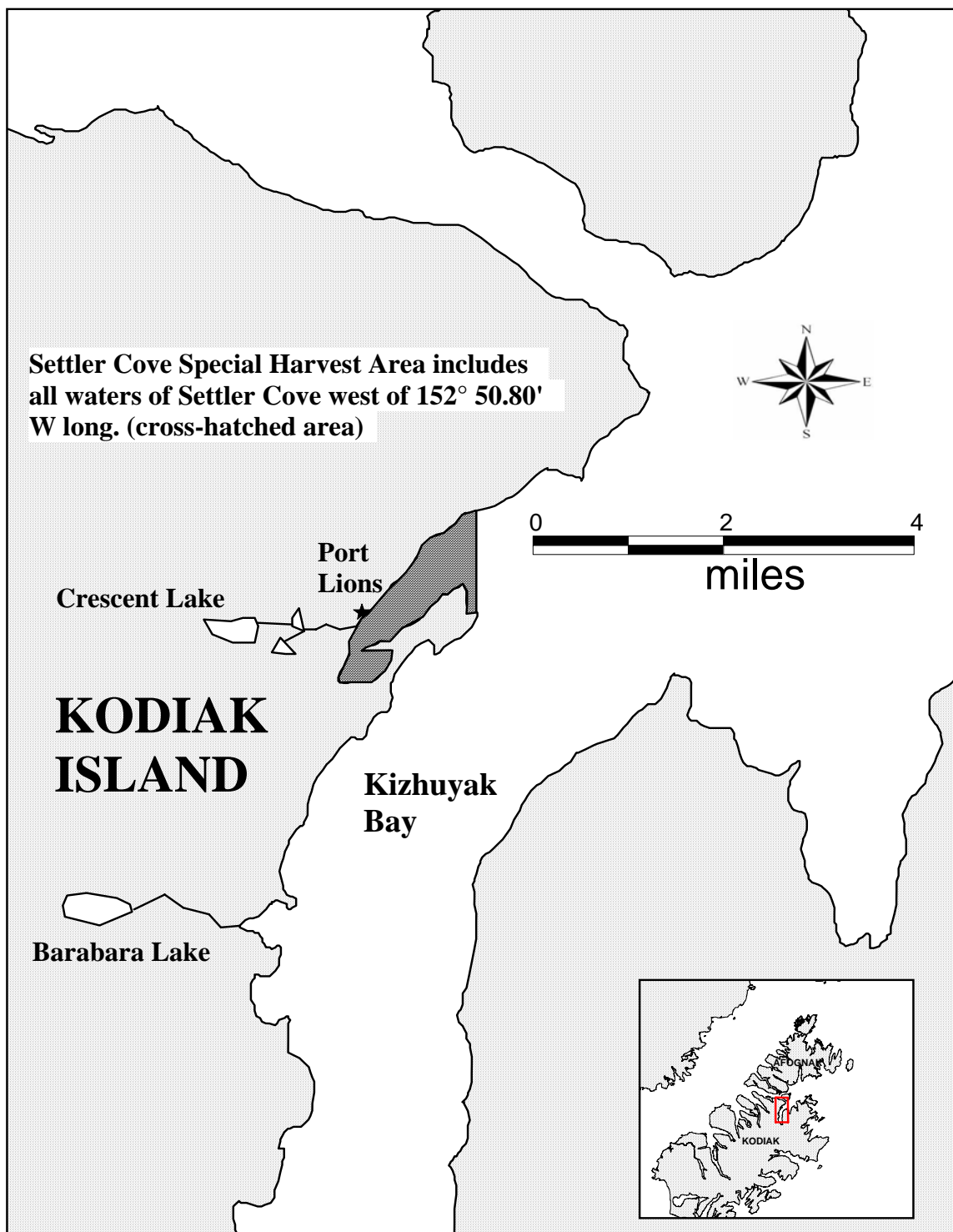


Figure 5.—Settle Cove (Crescent Lake) special harvest area boundaries in Kizhuyak Bay.

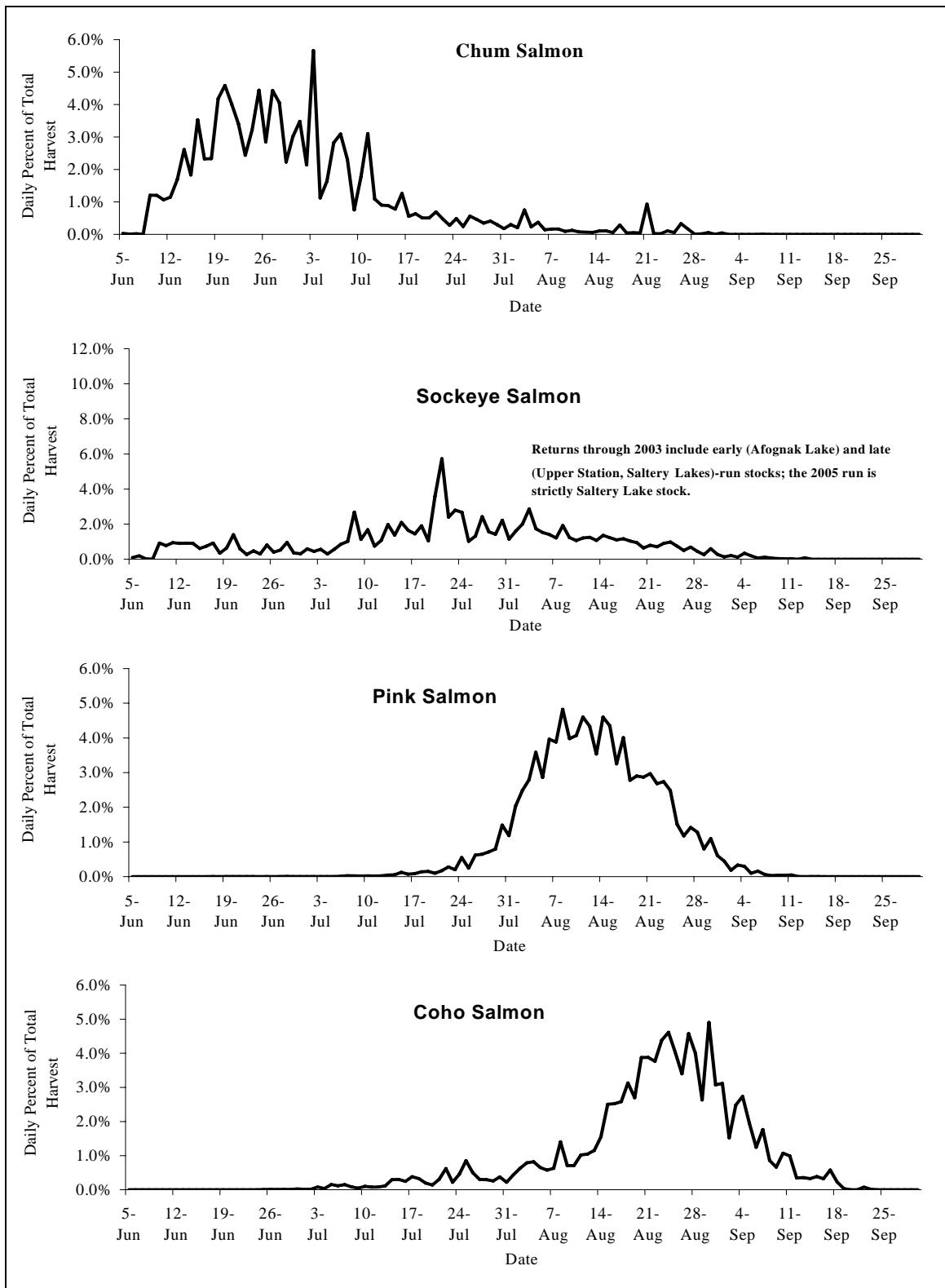


Figure 6.—The average daily (1997-2006) proportion to the total harvest of chum, sockeye, pink, and coho salmon in the Kitoi Bay area (combined harvests in the Izhut, Duck, and Kitoi Bay sections).

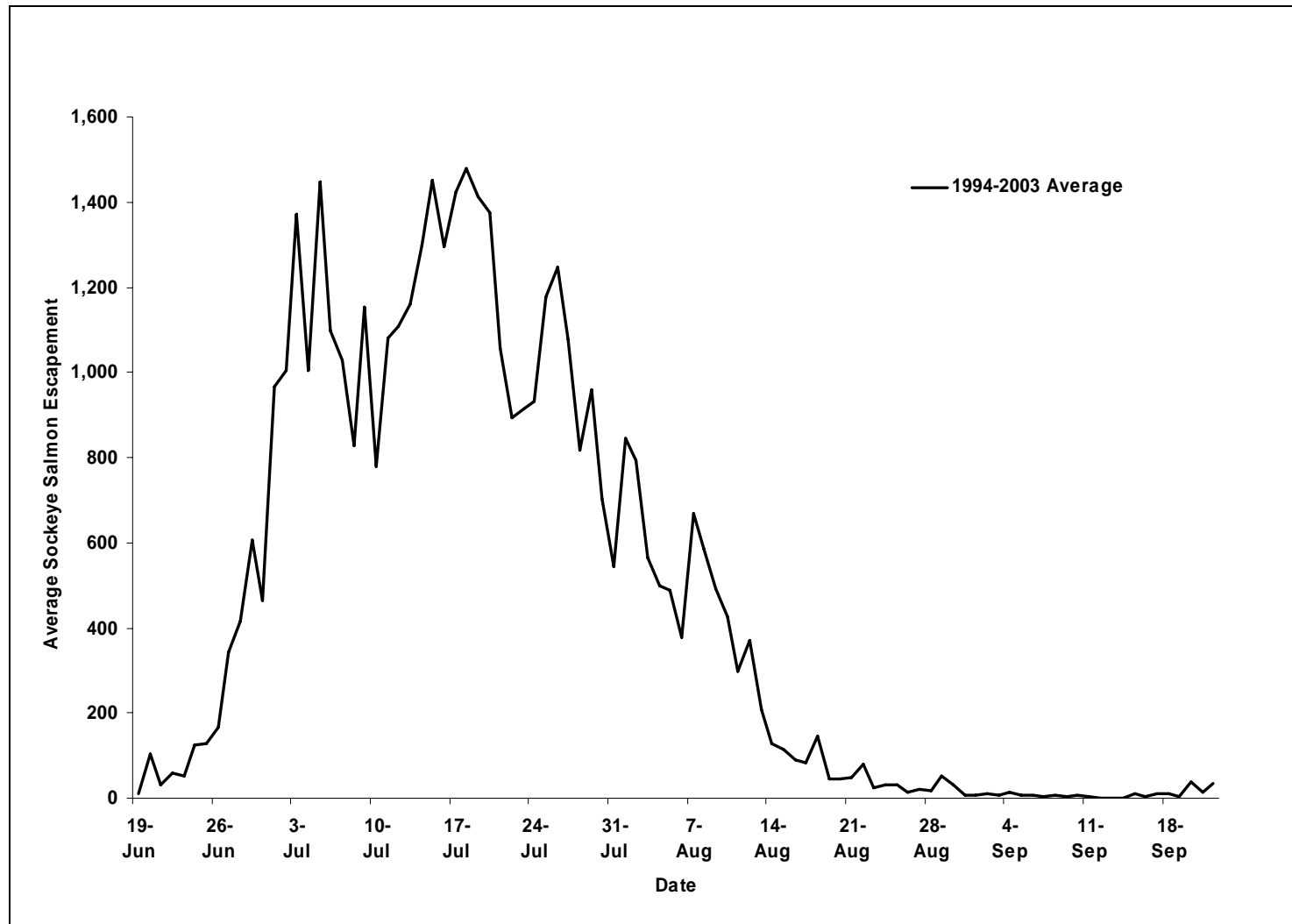


Figure 7.—Saltery Lake sockeye salmon average escapement timing, 1994-2003. *The weir has not operated since 2003.*

APPENDIX A: SALMON RELEASE HISTORY

Appendix A1.–Kitoi Bay Hatchery pink salmon releases, 1973-2006.

| Brood Year | Pink Salmon Releases ^a | | |
|---------------|-----------------------------------|-------------|-----------------------|
| | Year | Number | Average Weight (g) |
| 1972 | 1973 | 493,130 | |
| 1973 | 1974 | 447,642 | |
| 1974 | 1975 | 1,226,314 | |
| 1975 | 1976 | 2,486,410 | |
| 1976 | 1977 | 4,722,152 | 0.50 |
| 1977 | 1978 | 17,255,424 | 0.44 |
| 1978 | 1979 | 17,319,537 | |
| 1979 | 1980 | 22,458,947 | 0.63 |
| 1980 | 1981 | 26,351,664 | 0.93 |
| 1981 | 1982 | 47,828,701 | |
| 1982 | 1983 | 72,054,096 | 0.79 |
| 1983 | 1984 | 87,065,569 | 0.58 |
| 1984 | 1985 | 75,109,442 | 0.29 |
| 1985 | 1986 | 97,773,052 | 0.78 |
| 1986 | 1987 | 90,017,823 | 0.27 |
| 1987 | 1988 | 94,172,516 | 0.73 |
| 1988 | 1989 | 80,502,220 | 0.62 |
| 1989 | 1990 | 84,907,550 | 0.61 |
| 1990 | 1991 | 124,148,019 | 0.60 |
| 1991 | 1992 | 147,145,130 | 0.79 |
| 1992 | 1993 | 169,552,112 | 0.51 |
| 1993 | 1994 | 163,192,575 | 0.45 |
| 1994 | 1995 | 134,104,406 | 0.53 |
| 1995 | 1996 | 144,045,245 | 0.48 |
| 1996 | 1997 | 102,583,724 | 0.50 |
| 1997 | 1998 | 128,101,460 | 0.50 |
| 1998 | 1999 | 127,685,500 | 0.54 |
| 1999 | 2000 | 137,702,154 | 0.61 |
| 2000 | 2001 | 134,823,670 | 0.72 |
| 2001 | 2002 | 152,990,900 | 0.56 |
| 2002 | 2003 | 144,823,895 | 0.86 |
| 2003 | 2004 | 154,073,358 | 0.76 |
| 2004 | 2005 | 136,287,250 | 0.62 |
| 2005 | 2006 | 115,661,940 | 0.83 |

^a Big Kitoi Creek broodstock; juveniles (fry lifestage) were released into Big Kitoi Bay net pens for rearing, then released into Big Kitoi Bay.

Appendix A2.–Kitoi Bay Hatchery chum salmon releases, 1982-2006.

| Brood Year | Chum Salmon Releases ^a | | Average Weight (g) |
|---------------|-----------------------------------|------------|-----------------------|
| | Year | Number | |
| 1981 | 1982 | 36,846 | 0.56 |
| 1982 | 1983 | 105,058 | 1.05 |
| 1983 | 1984 | 630,422 | 1.16 |
| 1984 | 1985 | 784,078 | 0.67 |
| 1985 | 1986 | 414,233 | |
| 1986 | 1987 | 693,166 | 2.00 |
| 1987 | 1988 | 4,737,587 | 2.10 |
| 1988 | 1989 | 3,289,878 | 1.85 |
| 1989 | 1990 | 1,502,501 | 2.44 |
| 1990 | 1991 | 0 | |
| 1991 | 1992 | 22,214,472 | 1.80 |
| 1992 | 1993 | 10,101,986 | 2.02 |
| 1993 | 1994 | 6,507,497 | 1.52 |
| 1994 | 1995 | 9,738,472 | 1.51 |
| 1995 | 1996 | 20,139,843 | 1.27 |
| 1996 | 1997 | 23,500,000 | 1.50 |
| 1997 | 1998 | 12,310,015 | 1.50 |
| 1998 | 1999 | 6,859,982 | 1.02 |
| 1999 | 2000 | 22,334,640 | 1.70 |
| 2000 | 2001 | 20,032,140 | 1.73 |
| 2001 | 2002 | 19,593,070 | 1.55 |
| 2002 | 2003 | 18,721,700 | 1.66 |
| 2003 | 2004 | 21,778,050 | 2.01 |
| 2004 | 2005 | 21,578,500 | 2.02 |
| 2005 | 2006 | 17,567,016 | 2.39 |

^a Big Kitoi Creek broodstock released into Big Kitoi Bay.

Appendix A3.—Kitoi Bay Hatchery coho salmon releases by location (active projects), 1983-2006.

| Brood | | Coho Salmon Releases | | | | |
|-------|-------------------|----------------------|-----------|--------------------|------------|-----------------|
| | | Year | Number | Average Weight (g) | Life stage | Location |
| 1986 | Little Kitoi Lake | 1987 | 9,600 | 5.00 | Presmolt | Big Kitoi Creek |
| 1988 | Little Kitoi Lake | 1990 | 137,493 | 23.30 | Smolt | Big Kitoi Bay |
| 1990 | Little Kitoi Lake | 1992 | 60,755 | 32.00 | Smolt | Big Kitoi Bay |
| 1991 | Little Kitoi Lake | 1993 | 613,681 | 18.90 | Smolt | Big Kitoi Bay |
| 1992 | Little Kitoi Lake | 1993 | 5,163 | 14.60 | Presmolt | Big Kitoi Creek |
| 1992 | Little Kitoi Lake | 1994 | 97,973 | 28.40 | Smolt | Big Kitoi Bay |
| 1993 | Big Kitoi Creek | 1995 | 258,926 | 25.90 | Smolt | Big Kitoi Bay |
| 1994 | Big Kitoi Creek | 1996 | 894,486 | 23.54 | Smolt | Big Kitoi Bay |
| 1995 | Big Kitoi Creek | 1997 | 819,046 | 19.57 | Smolt | Big Kitoi Bay |
| 1996 | Big Kitoi Creek | 1998 | 769,000 | 23.90 | Smolt | Big Kitoi Bay |
| 1997 | Big Kitoi Creek | 1999 | 1,098,338 | 19.30 | Smolt | Big Kitoi Bay |
| 1998 | Big Kitoi Creek | 2000 | 871,448 | 16.92 | Smolt | Big Kitoi Bay |
| 1999 | Big Kitoi Creek | 2001 | 936,913 | 20.76 | Smolt | Big Kitoi Bay |
| 2000 | Big Kitoi Creek | 2002 | 1,041,342 | 16.90 | Smolt | Big Kitoi Bay |
| 2001 | Big Kitoi Creek | 2003 | 1,064,864 | 16.75 | Smolt | Big Kitoi Bay |
| 2002 | Big Kitoi Creek | 2004 | 969,483 | 20.08 | Smolt | Big Kitoi Bay |
| 2003 | Big Kitoi Creek | 2005 | 1,009,200 | 18.54 | Smolt | Big Kitoi Bay |
| 2004 | Big Kitoi Creek | 2006 | 976,059 | 17.06 | Smolt | Big Kitoi Bay |
| 1987 | Little Kitoi Lake | 1988 | 241,373 | 1.13 | Fingerling | Crescent Lake |
| 1988 | Little Kitoi Lake | 1989 | 202,955 | 0.82 | Fingerling | Crescent Lake |
| 1990 | Little Kitoi Lake | 1991 | 191,416 | 1.10 | Fingerling | Crescent Lake |
| 1991 | Little Kitoi Lake | 1992 | 69,100 | 7.04 | Presmolt | Crescent Lake |
| 1992 | Little Kitoi Lake | 1993 | 68,420 | 14.60 | Presmolt | Crescent Lake |
| 1993 | Big Kitoi Creek | 1994 | 163,680 | 0.98 | Fingerling | Crescent Lake |
| 1994 | Big Kitoi Creek | 1995 | 167,778 | 1.16 | Fingerling | Crescent Lake |
| 1995 | Big Kitoi Creek | 1996 | 163,200 | 0.40 | Fry | Crescent Lake |
| 1996 | Big Kitoi Creek | 1997 | 165,000 | 0.35 | Fry | Crescent Lake |
| 1997 | Big Kitoi Creek | 1998 | 163,000 | 0.60 | Fry | Crescent Lake |
| 1998 | Big Kitoi Creek | 1999 | 165,000 | 0.57 | Fry | Crescent Lake |
| 1999 | Big Kitoi Creek | 2000 | 165,837 | 0.42 | Fry | Crescent Lake |
| 2000 | Big Kitoi Creek | 2001 | 165,000 | 0.90 | Fry | Crescent Lake |
| 2001 | Big Kitoi Creek | 2002 | 164,487 | 0.65 | Fry | Crescent Lake |
| 2002 | Big Kitoi Creek | 2003 | 164,395 | 0.63 | Fry | Crescent Lake |
| 2003 | Big Kitoi Creek | 2004 | 165,000 | 0.76 | Fry | Crescent Lake |
| 2004 | Big Kitoi Creek | 2005 | 140,000 | 0.75 | Fry | Crescent Lake |
| 2005 | Big Kitoi Creek | 2006 | 121,410 | 0.84 | Fry | Crescent Lake |

-continued-

Appendix A3.—Page 2 of 2.

| Brood | | Coho Salmon Releases | | | | |
|-------|-------------------|----------------------|---------|------------|------------|----------------|
| | | | | Average | | Location |
| Year | Brood Stock | Year | Number | Weight (g) | Life stage | |
| 1991 | Little Kitoi Lake | 1992 | 162,387 | 4.50 | Fingerling | Jennifer Lakes |
| 1992 | Little Kitoi Lake | 1993 | 135,486 | 1.94 | Fingerling | Jennifer Lakes |
| 1994 | Big Kitoi Creek | 1995 | 165,000 | 1.46 | Fingerling | Jennifer Lakes |
| 1996 | Big Kitoi Creek | 1997 | 163,000 | 0.35 | Fry | Jennifer Lakes |
| 1997 | Big Kitoi Creek | 1998 | 165,000 | 0.50 | Fry | Jennifer Lakes |
| 1998 | Big Kitoi Creek | 1999 | 136,000 | 0.55 | Fry | Jennifer Lakes |
| 1999 | Big Kitoi Creek | 2000 | 155,688 | 0.44 | Fry | Jennifer Lakes |
| 2000 | Big Kitoi Creek | 2001 | 120,000 | 0.86 | Fry | Jennifer Lakes |
| 2001 | Big Kitoi Creek | 2002 | 201,320 | 0.57 | Fry | Jennifer Lakes |
| 2002 | Big Kitoi Creek | 2003 | 197,590 | 0.57 | Fry | Jennifer Lakes |
| 2003 | Big Kitoi Creek | 2004 | 200,000 | 0.76 | Fry | Jennifer Lakes |
| 2004 | Big Kitoi Creek | 2005 | 110,000 | 0.97 | Fry | Jennifer Lakes |
| 2005 | Big Kitoi Creek | 2006 | 199,943 | 0.78 | Fry | Jennifer Lakes |
| 1986 | Little Kitoi Lake | 1987 | 22,349 | 0.50 | Fingerling | Katmai Creek |
| 1987 | Little Kitoi Lake | 1988 | 20,000 | 0.70 | Fingerling | Katmai Creek |
| 1991 | Little Kitoi Lake | 1992 | 14,973 | 8.00 | Presmolt | Katmai Lake |
| 1992 | Little Kitoi Lake | 1993 | 15,052 | 14.60 | Presmolt | Katmai Lake |
| 1993 | Big Kitoi Creek | 1994 | 13,178 | 23.28 | Presmolt | Katmai Lake |
| 1994 | Big Kitoi Creek | 1995 | 16,489 | 5.87 | Presmolt | Katmai Lake |
| 1995 | Big Kitoi Creek | 1996 | 15,246 | 5.04 | Presmolt | Katmai Lake |
| 1996 | Big Kitoi Creek | 1997 | 15,735 | 7.33 | Presmolt | Katmai Lake |
| 1998 | Big Kitoi Creek | 1999 | 15,000 | 8.23 | Presmolt | Katmai Lake |
| 1999 | Big Kitoi Creek | 2000 | 15,000 | 7.40 | Presmolt | Katmai Lake |
| 2000 | Big Kitoi Creek | 2001 | 15,000 | 8.37 | Presmolt | Katmai Lake |
| 2001 | Big Kitoi Creek | 2002 | 15,000 | 6.23 | Presmolt | Katmai Lake |
| 2002 | Big Kitoi Creek | 2003 | 15,000 | 7.38 | Presmolt | Katmai Lake |
| 2003 | Big Kitoi Creek | 2004 | 15,000 | 7.02 | Presmolt | Katmai Lake |
| 2004 | Big Kitoi Creek | 2005 | 15,000 | 6.71 | Presmolt | Katmai Lake |
| 2005 | Big Kitoi Creek | 2006 | 15,000 | 6.48 | Presmolt | Katmai Lake |
| 1994 | Big Kitoi Creek | 1995 | 59,500 | 1.74 | Fingerling | Ruth Lake |
| 1996 | Big Kitoi Creek | 1997 | 35,000 | 0.35 | Fry | Ruth Lake |
| 1997 | Big Kitoi Creek | 1998 | 35,000 | 0.50 | Fry | Ruth Lake |
| 1998 | Big Kitoi Creek | 1999 | 35,000 | 0.57 | Fry | Ruth Lake |
| 1999 | Big Kitoi Creek | 2000 | 30,695 | 0.72 | Fry | Ruth Lake |
| 2001 | Big Kitoi Creek | 2002 | 30,000 | 0.69 | Fry | Ruth Lake |
| 2002 | Big Kitoi Creek | 2003 | 30,000 | 0.63 | Fry | Ruth Lake |
| 2003 | Big Kitoi Creek | 2004 | 30,000 | 0.76 | Fry | Ruth Lake |
| 2004 | Big Kitoi Creek | 2005 | 30,000 | 0.97 | Fry | Ruth Lake |
| 2005 | Big Kitoi Creek | 2006 | 30,886 | 0.78 | Fry | Ruth Lake |

Appendix A4.–Kitoi Bay Hatchery coho salmon releases by location (non-active), 1983-1995.

| Brood | | Coho Salmon Releases | | | | |
|-------|-------------------|----------------------|---------|------------|------------|--------------------|
| | | Year | Number | Average | | Location |
| Year | Brood Stock | | | Weight (g) | Life stage | |
| 1982 | Buskin | 1983 | 77,348 | 0.85 | Fingerling | Buskin Lake |
| 1983 | Buskin | 1984 | 43,288 | 0.64 | Fingerling | Buskin Lake |
| 1984 | Buskin | 1985 | 45,645 | 1.88 | Fingerling | Buskin Lake |
| 1985 | Buskin | 1986 | 50,024 | 0.79 | Fingerling | Buskin Lake |
| 1994 | Big Kitoi Creek | 1995 | 59,030 | 2.50 | Fingerling | Elk Lake |
| 1994 | Big Kitoi Creek | 1995 | 28,350 | 2.41 | Fingerling | Finger Lake |
| 1987 | Little Kitoi Lake | 1988 | 137,585 | 1.13 | Fingerling | Hidden Lake |
| 1988 | Little Kitoi Lake | 1989 | 239,817 | 0.85 | Fingerling | Hidden Lake |
| 1990 | Little Kitoi Lake | 1991 | 250,889 | 1.25 | Fingerling | Hidden Lake |
| 1983 | Little Kitoi Lake | 1984 | 131,825 | 0.96 | Fingerling | Kodiak Road System |
| 1984 | Little Kitoi Lake | 1985 | 109,568 | 0.90 | Fingerling | Kodiak Road System |
| 1984 | Little Kitoi Lake | 1985 | 12,731 | 2.60 | Fingerling | Kodiak Road System |
| 1985 | Little Kitoi Lake | 1986 | 141,750 | 1.08 | Fingerling | Kodiak Road System |
| 1986 | Little Kitoi Lake | 1987 | 103,824 | 1.03 | Fingerling | Kodiak Road System |
| 1987 | Little Kitoi Lake | 1988 | 84,600 | 1.18 | Fingerling | Kodiak Road System |
| 1988 | Little Kitoi Lake | 1989 | 87,585 | 0.80 | Fingerling | Kodiak Road System |
| 1989 | Little Kitoi Lake | 1990 | 36,040 | 1.75 | Fingerling | Kodiak Road System |
| 1990 | Little Kitoi Lake | 1991 | 83,530 | 1.24 | Fingerling | Kodiak Road System |
| 1991 | Little Kitoi Lake | 1992 | 51,500 | 1.60 | Fingerling | Kodiak Road System |
| 1991 | Little Kitoi Lake | 1992 | 15,200 | 8.00 | Presmolt | Kodiak Road System |
| 1992 | Little Kitoi Lake | 1993 | 64,000 | 1.76 | Fingerling | Kodiak Road System |
| 1983 | Little Kitoi Lake | 1984 | 127,700 | 1.00 | Fingerling | Little Kitoi Lake |
| 1984 | Little Kitoi Lake | 1985 | 33,472 | 1.50 | Fingerling | Little Kitoi Lake |
| 1985 | Little Kitoi Lake | 1986 | 53,360 | 6.10 | Presmolt | Little Kitoi Lake |
| 1986 | Little Kitoi Lake | 1987 | 171,103 | 1.79 | Fingerling | Little Kitoi Lake |
| 1987 | Little Kitoi Lake | 1988 | 43,807 | 1.52 | Fingerling | Little Kitoi Lake |
| 1991 | Little Kitoi Lake | 1992 | 70,605 | 1.40 | Fingerling | Little Kitoi Lake |
| 1992 | Little Kitoi Lake | 1993 | 139,147 | 1.30 | Fingerling | Little Kitoi Lake |
| 1983 | Little Kitoi Lake | 1984 | 5,000 | 2.54 | Fingerling | Shemya |

^a Kodiak Road System refers to lakes adjacent to maintained roads accessible from the City of Kodiak.

Appendix A5.—Kitoi Bay Hatchery sockeye salmon releases by location, 1989-2006.

| Brood Year | Brood Stock | Sockeye Salmon Releases | | | | |
|---------------|-------------------|-------------------------|-----------|-----------------------|-----------------------|--------------------------------|
| | | Year | Number | Average Weight (g) | Life stage | Location |
| 1988 | Upper Station | 1989 | 143,725 | 2.48 | Zero Check Smolt | Little Kitoi Bay |
| 1989 | Upper Station | 1990 | 249,346 | 0.20 | Fry | Spiridon |
| | | 1990 | 241,000 | 0.50 | Fingerling | Little Kitoi Lake |
| | | 1990 | 337,932 | 0.18 | Fry | Little Kitoi Lake |
| | | 1990 | 854,610 | 3.23 | Zero Check Smolt | Little Kitoi Bay |
| | | 1990 | 458,118 | 0.48 | Zero Check Fingerling | Little Kitoi Bay |
| 1990 | Upper Station | 1991 | 1,250,000 | 2.50 | Zero Check Smolt | Little Kitoi Bay |
| 1991 | Upper Station | 1992 | 1,463,000 | 1.60 | Zero Check Smolt | Little Kitoi Bay |
| 1992 | Upper Station | 1993 | 52,418 | 3.13 | Presmolt | Little Kitoi Lake |
| | | 1993 | 180,000 | 0.50 | Fingerling | Jennifer Lakes |
| | | 1994 | 326,500 | 15.00 | Smolt | Little Kitoi Bay |
| 1993 | Upper Station | 1994 | 1,672,710 | 1.11 | Zero Check Smolt | Little Kitoi Bay |
| | Little Kitoi Lake | 1994 | 10,108 | 4.60 | Presmolt | Little Kitoi Lake |
| | | 1995 | 916,677 | 10.08 | Smolt | Little Kitoi Bay |
| 1994 | Upper Station | 1995 | 266,952 | 1.83 | Zero Check Smolt | Little Kitoi Lake |
| | Little Kitoi Lake | 1995 | 84,861 | 4.98 | Presmolt | Little Kitoi Lake |
| | | 1996 | 573,242 | 12.70 | Smolt | Little Kitoi Bay |
| 1995 | Little Kitoi Lake | 1996 | 155,687 | 3.16 | Presmolt | Little Kitoi Lake |
| | Upper Station | 1997 | 587,435 | 12.10 | Smolt | Little Kitoi Bay |
| 1996 | Little Kitoi Lake | 1997 | 77,039 | 3.31 | Presmolt | Little Kitoi Lake |
| | Little Kitoi Lake | 1998 | 99,085 | 11.70 | Presmolt | Little Kitoi Lake |
| | Little Kitoi Lake | 1998 | 397,000 | 15.10 | Smolt | Little Kitoi Bay |
| 1997 | Saltery Lake | 1999 | 106,658 | 17.70 | Smolt | Little Kitoi Lake |
| 1998 | Saltery Lake | 1999 | 98,737 | 7.00 | Fingerling | Little Kitoi Lake |
| | | 1999 | 74,463 | 14.63 | Presmolt | Little Kitoi Lake |
| | | 1999 | 23,756 | 14.35 | Presmolt | Little Kitoi Bay ^a |
| 1999 | Saltery Lake | 2000 | 154,039 | 11.31 | Presmolt | Little Kitoi Lake |
| 2000 | Saltery Lake | 2001 | 282,089 | 9.53 | Presmolt | Little Kitoi Lake |
| 2001 | Saltery Lake | 2002 | 212,418 | 6.55 | Presmolt | Little Kitoi Lake |
| 2002 | Saltery Lake | 2003 | 102,822 | 8.75 | Presmolt | Little Kitoi Lake |
| 2002 | Saltery Lake | 2003 | 193,646 | 25.68 | Presmolt | Little Kitoi Lake ^b |
| 2003 | Saltery Lake | 2004 | 20,664 | 9.4 | Presmolt | Little Kitoi Lake |
| 2003 | Saltery Lake | 2005 | 279,962 | 24.15 | Presmolt | Little Kitoi Lake ^b |
| 2004 | Saltery Lake | 2005 | 20,000 | 7.89 | Presmolt | Little Kitoi Lake |
| 2004 | Saltery Lake | 2006 | 379,687 | 22.82 | Presmolt | Little Kitoi Lake |
| 2005 | Saltery Lake | 2006 | 206,884 | 6.14 | Presmolt | Little Kitoi Lake |

^a This release resulted from a dissolved oxygen crash in the transfer tank.

^b Non-volitional release, after short-term net pen rearing.

SIGN-OFF for the 2007 Kitoi Bay Hatchery Annual Management Plan



Andrew Aro: Kitoi Bay Hatchery Manager, KRAA

7-5-07


Date



Steve Schrof: Regional Resource Development Biologist, CFD

6/25/07

Date



David Sterritt: Regional Finfish Management Supervisor, CFD

6-25-07

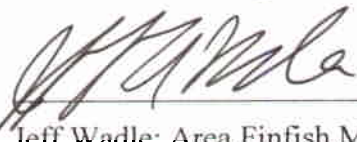
Date



Steve Honnold: Regional Finfish Research Supervisor, CFD

6/25/07


Date



Jeff Wadle: Area Finfish Management Biologist, CFD

6/28/07

Date



Jim McCullough: Regional Supervisor, CFD

6/28/07

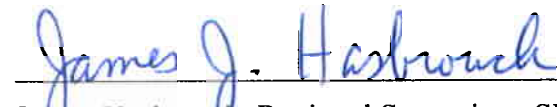
Date



Len Schwarz: Area Biologist, SFD

7/3/07

Date



James Hasbrouck: Regional Supervisor, SFD

7/9/2007

Date




Kevin Brennan: Executive Director, KRAA

7-5-07

Date

The 2007 Hatchery Management Plan for PCH is hereby approved:



Denby S. Lloyd: Commissioner, ADF&G, Juneau

7/27/07

Date